TECHNICAL REPORT
NATICK/TR-10/008

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INDIVIDUAL COMBATANT'S WEAPONS FIRING ALGORITHM PHASE I OPTION

by
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14. ABSTRACT
Report developed under Small Business Innovation Research contract. Based on findings in Phase I, this effort developed a prototype data acquisition tool that can be used to collect large amounts of data over the WWW. In testing this tool, we acquired more data for the ICWFA that includes fuzzy estimates of factors influencing the target selection prioritization scheme, aim point, mode of fire, and estimates on Phit/Pmiss for a single SME. Also undertaken in this phase of the study was the development of a movie/concept demonstration to be distributed to other government agencies so that we can begin efforts in enhancing commercialization of product. Target markets will include both the analysis and training communities.

15. SUBJECT TERMS

SKILLS	SIMULATORS	DECISION MAKING	TARGET SELECTION
INTERNET	PROTOTYPES	VIRTUAL REALITY	INTELLIGENT AGENTS
SIMULATION	SBIR REPORTS	DATA COLLECTION	VIRTUAL ENVIRONMENT
ALGORITHMS	WEAPONS FIRING	MILITARY TRAINING	INDIVIDUAL COMBATANTS

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS and ABBREVIATIONS

AAR	After Action Review
CGF	Computer Generated Force
HBR	Human Behavior Representation
IC	Individual Combatant
ICT	Institute for Creative Technologies
ICWFA	Individual Combatant Weapon Firing Algorithm
IOBC	Infantry Officer Basic Course
KA	Knowledge Acquisition
MOUT	Military Operations in Urban Terrain
PEO	Program Executive Office
RDECOM	Research, Development, and Engineering Command
RDT	Rapid Decision Trainer
RHS	Right Hand Side
ROE	Rules of Engagement
SAF	Semi-Automated Forces
SME	Subject Matter Expert
SOF	Special Operations Forces
SSCOM	Soldiers System Command
STRI	Simulation Training and Instrumentation
STTC	Simulation and Training Technology Center
WFA	Weapon Firing Algorithm

EXECUTIVE SUMMARY

Research Objective:
Report developed under a Small Business Innovation Research Program 2000.2 contract for topic A01.2-203. Based on findings in Phase I, this effo rt developed a prototype dat a acquisition tool that can be used to collect large amounts of data over the WWW. In testing this tool, we acquired more data for the ICWFA that includes fuzzy estimates of factors influencing the target selection prioritization scheme, aim point, mode of fire, and estimates on Phit/Pmiss for a single SME. Also undertaken in this phase of the study was the dev elopment of a movie/concept demonstration to be distributed to other government agencies so that we can begin efforts in enhancing commercialization of product. Target markets will include both the analysis and training communities.

Work Accomplished:

- Collected data on fuzzy estimates of factors ident ified in Phase I, aim points, mode of fire, and collected estimates on Pmiss/Phit based on those factors.
- Developed prototype data acquisition tool t hat can be used for web-based data collection effort.
- Developed concept demonstration to be used in commercialization efforts.
- Developed contacts for equipment and SMEs needed in future on-sight data collection efforts at USMA, Ft. Bragg, and RDECOM-STTC.

Conclusions:
The majority of work in this phase of project was allocated to the devel opment of data acquisition system. While the immediate benefits of this tool are somewhat unrealized, we believe the investment will poise us to both collect and analyze data more efficiently in the future. Initial efforts to test the system have proven that it's easier for SMEs to work with and provides us data in format that facilitates analysis. Further, as this tool is targeted for use over the WWW, we believe it will provide us will a wealth of data that can be used to support ICWFA.

1 Introduction and Overview

Essentially, our work performed in Option Phase of project focused on extending algorithm developed previously and on preparing for future data collection efforts. As such, this document is partitioned accordingly, where the next section, Section 2, present s the enhancement of the previously developed algorithm and then the following section, Section 3, presents efforts undertaken to prepare for future data collection efforts.

2 Enhancement of Past Work - Algorithm Extension

2.1 MOUT Target Selection Algorithm

The algorithm developed in Phase I focused mainly on target selection. That is, given some combination of factors, this algorithm presented priority scheme generalized over a number of subject matter experts (SMEs). As evidenced in Figure 1, however, a number of other factors are

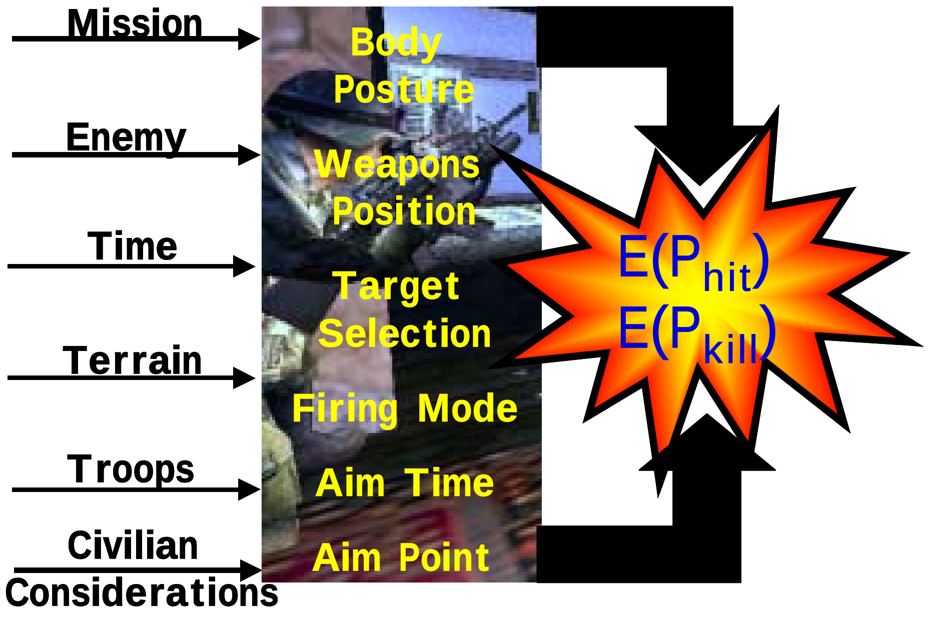


Figure 1. Relationships of WFA Factors

important in an individual combatant weapons firing algorithm (ICWFA). Information lacking in that initial algorithm but partially available in previously collected data include: percentages associated with dissimilar prioritization schemes, firing mode, aim points, and estimates of Phit/Pkill/Pmiss.

Data not available from initial effort was collected and may be seen in Appendix A. Appendix A is an output file from a prototype data acquisition tool we have developed named FiTKAT. This tool is detailed further in Section 3.0. These data must still be cleanly integrated into the existing algorithm. Once finished, this will provide fuzzy estimates of factors of target threat and a point estimate of SME’s expectation of the probability of hitting the target given that set of factors.

2.2 Consideration of Human Science/Modeling Efforts

2.2.1 Review of Report: Squad Synthetic Environment Study (May, 2002)

We reviewed title report to see how it could be us ed in the ICWFA. While investigation collected a variety of data on a number of applicable scenarios involving SMEs interacting in a virtual environment, the data were presented in aggregate fo rm and thus only minimally useful to our effort. For example, the engagement times reported include time to detect target, identify target, and shoot target. In algorithm being devel oped here, perceptual events (e.g., detection and identification) are beyond the scope of the effort. Of note, how ever, are data collected on aiming techniques and aim point, which complement the ICWFA. Also of note is the point made on future plans to statistically compare data in this report with data collected in the follow-on McKenna MOUT Study (see Section 2.2.2) to determine whether data collected in simulated environments can adequately represent data collected in live training exercises. The results of this comparison are of interest, as use of virtual environment to facilitate data collection is being considered for development of parts of the ICWFA.

2.2.2 Review of Report: McKenna MOUT Study (September, 2002)

We reviewed title report to see how it could be us ed in the ICWFA. While investigation collected a variety of data on a number of applicable scenarios, the data were presented in aggregate form and thus only minimally useful to our effort. For example, the engagement times reported include time to detect target, identify target, and sgoot target. In algorithm being developed here, perceptual events (e.g., detection and identification) are beyond the sc ope of the effort. Of note, however, are data collected on aiming techniques and aim point, which complement the ICWFA. Also of note is the point made on future plans to statistically compare data in this report with data collected I the Squad Synthetic Environment Study (see Section 2.2.1) to determine whether data collected in simulated environments can adequately represent data collected in live training exercises. The results of this comparison are of interest, as a similar approach is being proposed for development of parts of the ICWFA.

3 Preparation for Future Work

3.1 Knowledge Acquisition Tool

By and large, the biggest part of our work has focused on the development of a Knowledge Acquisition Tool we can use to automate the know ledge acquisition process. Initial prototype of this tool is called First Target Knowledge Acquisition Tool (FiTKAT) and is developed around the target selection task. However, with bulk of work produced in prototype effort, the tool can be generalized to accommodate different types of data acquisition needs (e.g., fighting positions, Team Leader target assignments, use of suppressive fire, etc).

The user manual for this tool can be seen in Appendix B and the source code is available in Appendix C. These files are both provided electronically as well, and the latter is in executable form for any mac hine with J ava interpreter ins talled. Because this tool is implemented in Java, our future plans include enabling access to it over the World Wide Web (WWW). Our vision is to be able to collect data over the internet from Soldiers and Marines who are currently deployed.

3.2 SME Arrangements and Future Data Collection Efforts

In preparation for Phase II, a number of contacts who could assist with data collection devices and/or acquiring SMEs were investigated. The most promising contacts include:

• COL. Charles Stanley and CAPT Carl Jacquet of Department of Military Instruction (DMI) at United States Military Academy (USMA), West Point. COL. Stanley and CAPT. Jacquet assisted in Phase I, by hosting us and providing SMEs for data collection efforts. Upon learning of our efforts to continue the project and collect additional data, COL. Stanley graciously invited us to return to DMI, USMA for further work. He added that his department has recently acquired a number of NCOs returning from Afghanistan and Iraq. We anticipate this to be a strong, reliable source of data for us.

• LTC. Rick Matthews (U.S. Army, Ret), now employed at PEO STRI and LTC. Joseph Giunta, PM for Ground Systems at PEO STRI have offered their assistance in securing equipment and SMEs at Ft. Bragg for use in our data collection efforts. Specifically, they have contacts that can help us to use the Ft. Bragg Simulation Lab's Engagement Skills Trainer 2000 (EST 2000) and get SMEs (both from Special Forces and from 82nd Airborne) to work with at Ft. Bragg. The EST 2000 (see Figure 2) is used to simulate weapons training events which leads to live-fire individual/crew weapon qualifications. It is used primarily as a unit/institutional, indoor, multipurpose, multilane, small arms, crew served and individual anti-tank training simulator. And, it provides initial and sustainment marksmanship training, static unit collective gunnery and tactical training, and Shoot/Don't Shoot training. It includes MOUT scenarios. Additionally, the

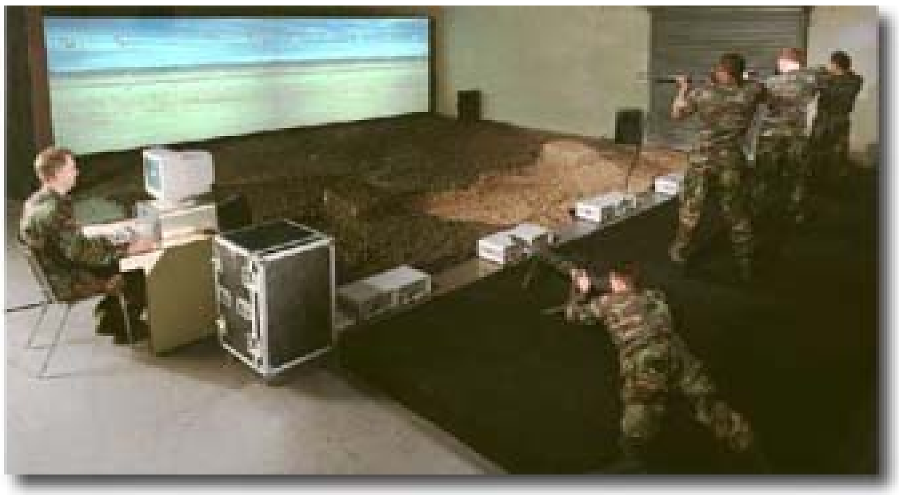


Figure 2. Engagement Skills Trainer 2000

Research Development and Engineering Command (RDECOM) Simulation and Training Technology Center (STTC) in Orlando currently has an EST 2000 for display. Thus, we can likely prepare for data collection locally in Orlando, and then only deploy for the actual data collection effort itself.

• Mr. Bill Pike of RDECOM-STTC is overseeing the development of a PC-based tactical decision trainer for newly commissioned lieutenants in the US Army Infantry School at Ft. Benning, GA. This low-cost, PC-based, rapid decision trainer, provides "virtual live-fire" training opportunity for all IOBC students to participate in a key leadership role as squad or platoon leader. Scenarios allow students to demonstrate their tactical knowledge by requiring them to make decisions in the virtual simulation that are similar to those required during a live-fire exercise. Further, the trainer allows single-player or multi-player participation. The project is creating basic scenarios for each range (Ware and Griswold) replicating the live-fire exercises currently being performed at IOBC and it tracks and evaluates the decisions made by the students as they participate in the virtual training event.

This document reports research undertaken at the U.S. Army Natick Soldier Research, Development and Engineering Center, Natick, MA, and has been assigned No. NATICK/TR-10/008 in a series of reports approved for publication.

References

1. Pike, W. and Hart, C. (2003). Infantry Officer Basic Course (IOBC) Rapid Decision Trainer (RDT). In Proceedings of 2003 Interservice/Industry Training, Simulation, and Education Conference.

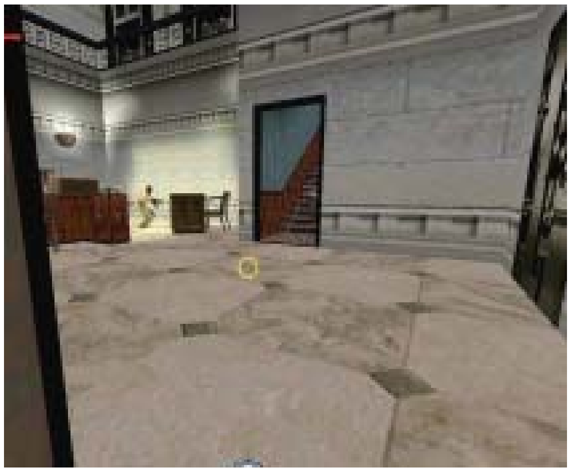
2. Statkus, M., Dutoit, G., Garrett, A., Salvi, L., McMahon, R., Auer, R., Sa mpson, J., Short, P., and Middleton, V. (2002). Human Science/Modeling and Analysis Data: Squad Synthetic Environment Study, 23 April 2001 Through 4 May 2001. Technical Report NATICK/TR-02/015L, U.S. Army Solider and Biological Chemical Command.

3. Statkus, M., Auer, R., Cronk, A., Garrett, A., McMahon, R., Middleton, V., Salvi, Lu., Sampson, J., Short, P., and Spring, R. (2002). Human Sc ience/Modeling and Analysis Data: McKenna MOUT Study, 9 July 2001 Through 20 July 2001. Technical Report NATICK/TR-02/024L, U.S. Army Solider and Biological Chemical Command.

Appendix A: SME Fuzzy Estimates on Factors and Estimates on Phit/Pmiss

```
Name: Rick Matthews
Rank: Officer (MAJ)
----------
1: 43 or higher
2: Over 20
3: Platoon Leader
4: 2-5 years ago
5: No Response
6: 3-9
7: 100%
8: Situational Awareness
9: More than 6 years
**********************
```

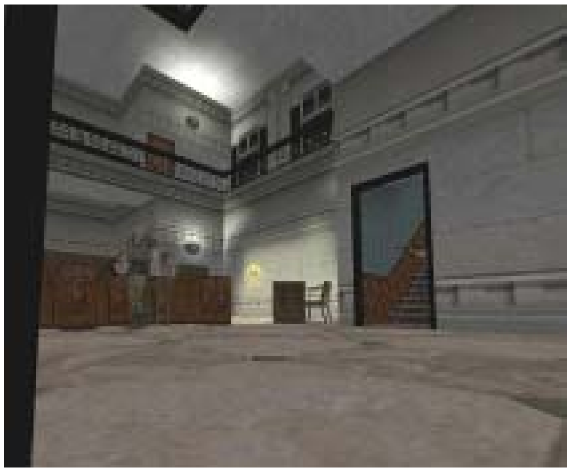
```
FILENAME: group1_1.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 172       181   278   290
      152 170 284 291 0            0     0     0
2 3             1 3 2                   2 223       230   281   292
      211 227 288 311 211 227 311 343
3 3             1 3 2                   2 0 0 0 0
      482 487 280 305 479 486 314 333
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 0 0
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

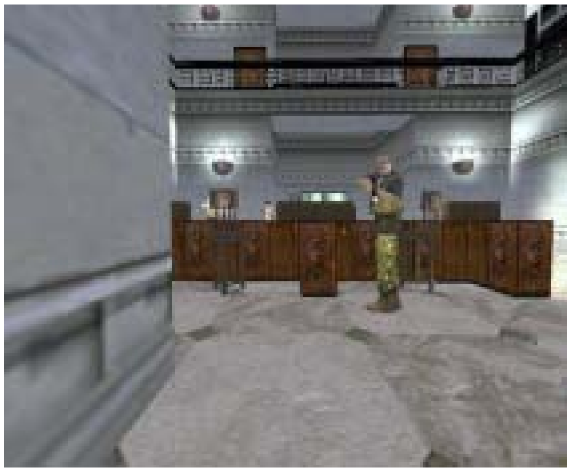
```
FILENAME: group1_2.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 203       217   342   363
      195 231 358 422 195 223 418 502
2 3             1 3 2                   2 654       657   363   370
      652 660 374 406 0             0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 0 0
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

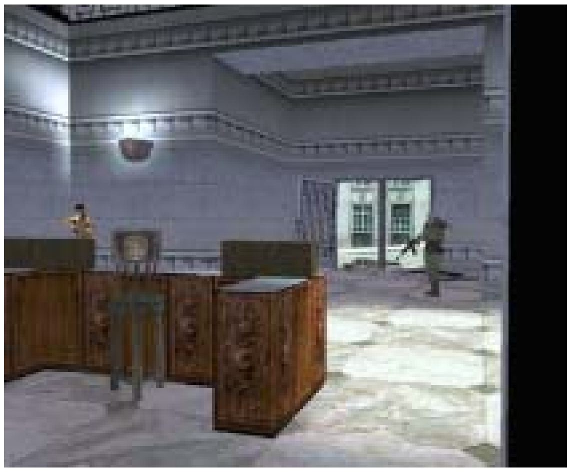
```
FILENAME: group1_3.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 1             3 2 1                3 313       325   293   308
      308 334 307 332 0            0     0     0
2 2             3 2 1                3 408       415   304   313
      406 418 312 331 410 418 330 333
3 3             1 3 2                2 579       603   233   262
      573 620 257 354 579 617 352 474
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 0 0
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

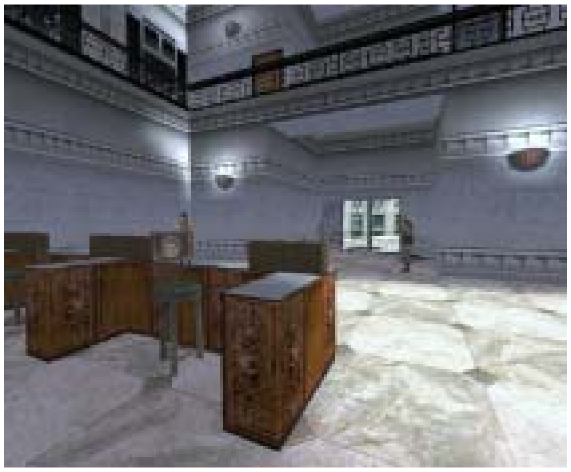
```
FILENAME: group1_4.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2              3 2 1                 3 111       126   310   329
      107 136 329 363 0            0     0     0
2 3              1 3 2                 2 548       555   390   402
      556 583 395 407 595 618 397 405
3 3              1 3 2                 2 660       670   320   335
      654 685 332 386 655 679 385 452
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 109 328
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

```
FILENAME: group1_5.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                   3 277       284   323   335
      272 293 334 351 0            0      0     0
2 3               1 3 2                   5 0 0 0 0
      534 566 371 381 574 587 374 379
3 3               1 3 2                   2 620       628   324   335
      617 638 334 370 619 634 369 415
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 280 336
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
80
```

```
FILENAME: group1_6.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 3             1 3 2                   2 129       141   428   441
      125 151 437 452 136 158 460 478
2 2             3 2 1                   3 0 0 0 0
      234 253 383 401 0             0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
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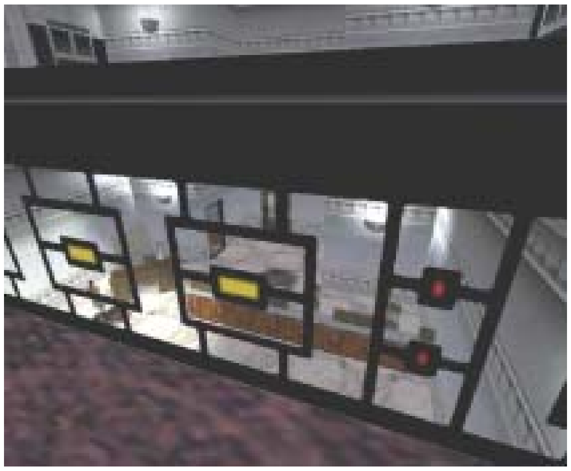


```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 137 436
AimPoint: head

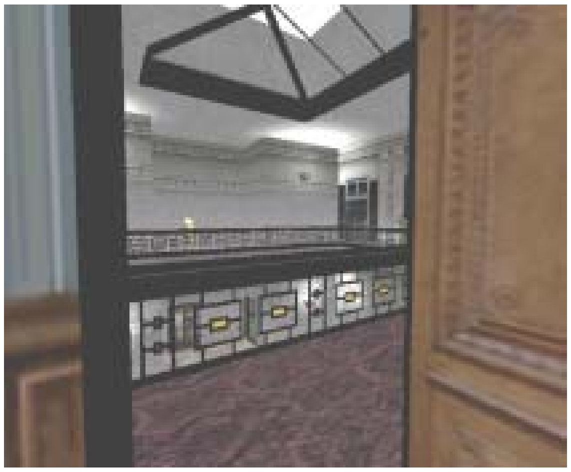
After-Action Review
-------------------
M4Mode:
Single Shot
p_hit:
50
```

```
FILENAME: group1_7.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                 3 291       300   263   275
      281 306 269 285 278 303 292 314
2 3             1 3 2                 2 629       640   259   268
      624 642 267 285 627 641 290 315
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```

```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 635 272
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
50
```

```
FILENAME: group1_8.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                   3 285       293   326   331
      280 331 297 345 285 298 355 377
2 3               1 3 2                   2 615       624   324   332
      608 629 331 345 616 630 349 370
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 289 330
AimPoint: head

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
50
```

```
FILENAME: group2_1.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 343       362   194   219
      350 389 214 295 358 389 291 387
2 3             1 3 2                   2 427       435   245   254
      429 448 254 285 434 448 284 329
3 3             1 3 2                   2 600       615   215   234
      599 630 233 292 599 620 291 367
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
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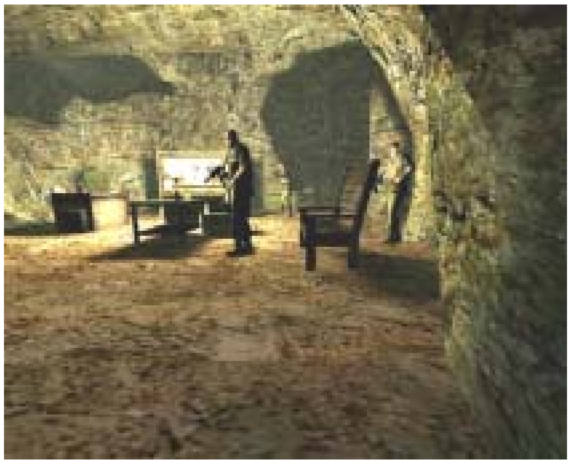
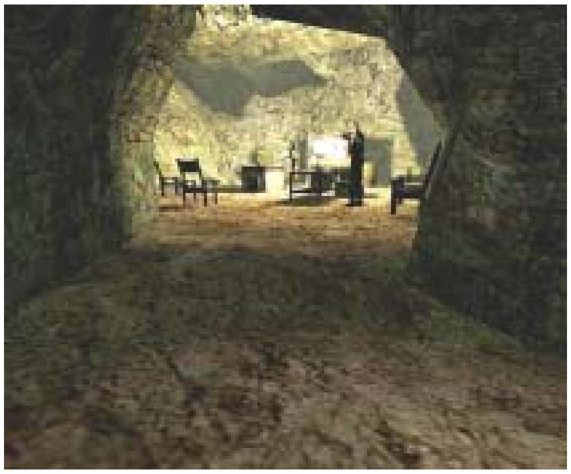


```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 433 253
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
30
```

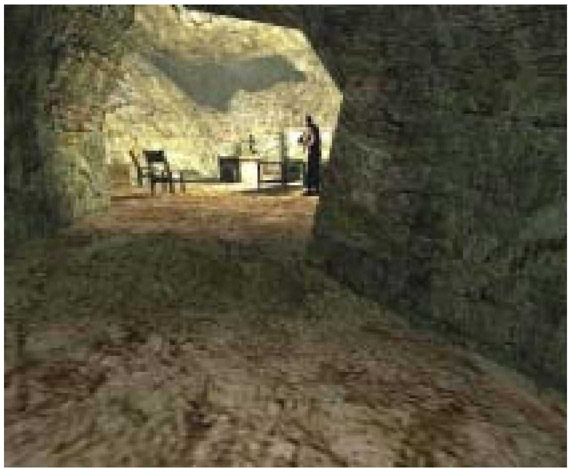
```
FILENAME: group2_2.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                   3 446       454   210   219
      446 461 218 245 449 462 244 281
2 3               1 3 2                   2 539       551   181   195
      537 561 197 247 540 561 247 310
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 543 208
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
80
```

```
FILENAME: group2_3.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2              3 2 1                   3 384       388   199   206
      382 398 206 233 0             0     0     0
2 3              1 3 2                   2 467       479   170   187
      478 494 186 233 472 491 231 293
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 384 211
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
50
```

```
FILENAME: group3_1.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                 3 569       582   259   272
      559 583 267 306 553 591 296 349
2 3             1 3 2                 2 0 0 0 0
      618 652 254 285 619 649 282 311
3 3             1 3 2                 2 0 0 0 0
      601 620 111 130 0           0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
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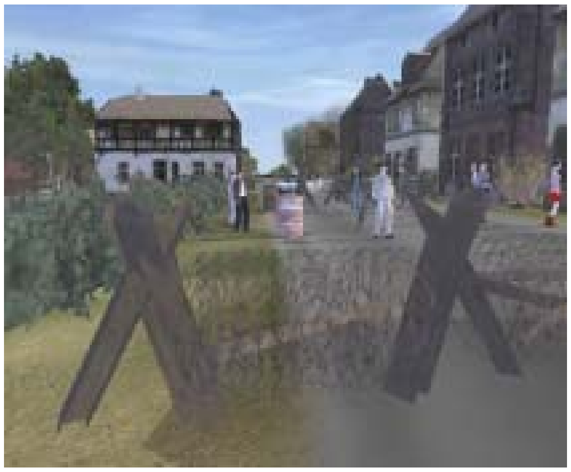
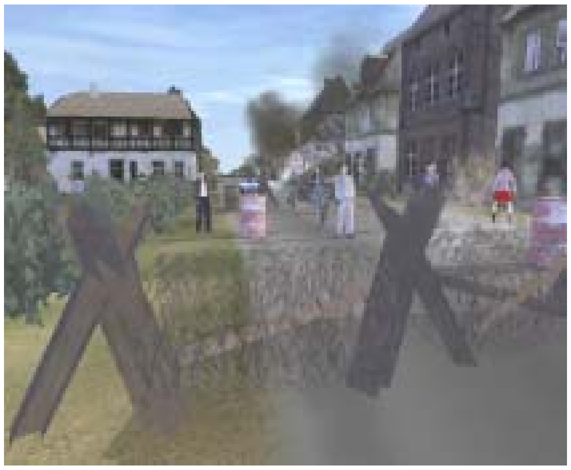


```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 576 263
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
50
```

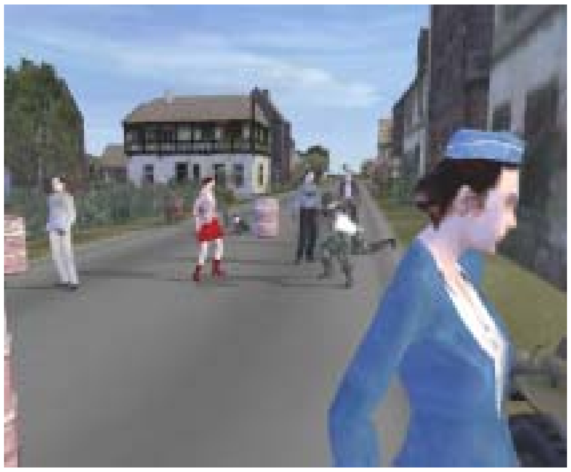
```
FILENAME: group3_2.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 445       455   256   265
      442 462 263 285 441 458 280 312
2 3             1 3 2                   2 505       521   257   272
      499 525 272 300 492 529 296 347
3 3             1 3 2                   2 0 0 0 0
      538 555 116 132 0            0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 512 261
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
50
```

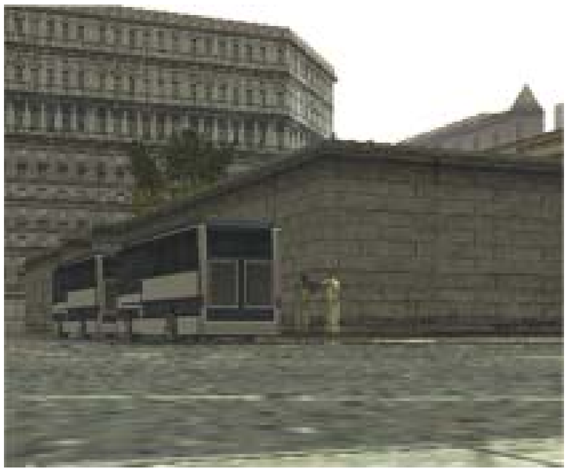
```
FILENAME: group3_3.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                 3 0 0 0 0
      324 343 279 307 328 355 307 341
2 3             1 3 2                 2 495       520   289   316
      493 551 308 364 495 544 352 440
3 3             1 3 2                 2 0 0 0 0
      539 568 359 387 563 614 361 383
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 522 331
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

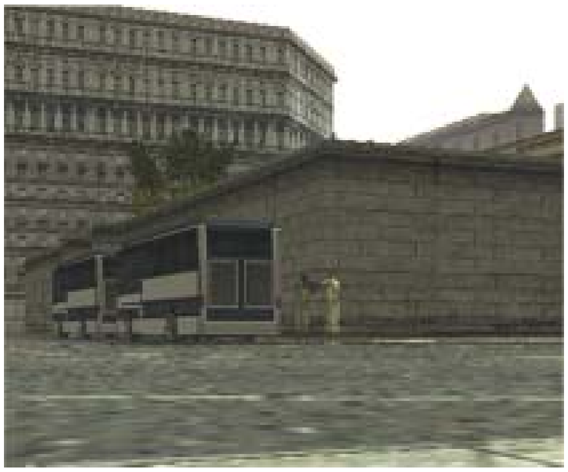
```
FILENAME: group3_4.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
-------------------------------------------------------------------------
-------------------------------------------------------------------------
-------------
1 2               3 2 1                   3 0 0 0 0
      527 544 101 116 0           0     0     0
2 3               1 3 2                   2 521       536   285   300
      516 550 296 314 551 565 294 311
-------------------------------------------------------------------------
-------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 531 293
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

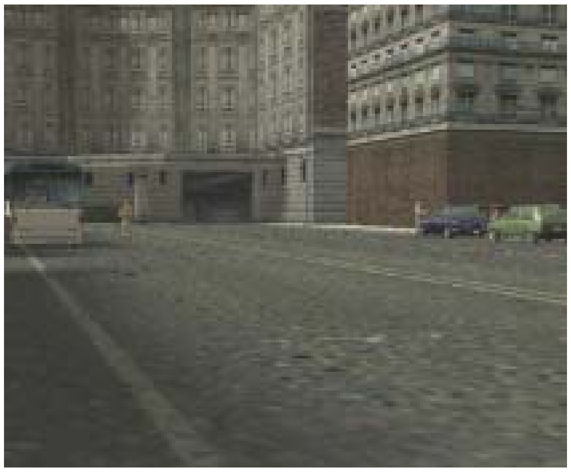
```
FILENAME: group4_1.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                   3 462       472   419   430
      455 476 430 475 454 478 461 523
2 3               1 3 2                   2 501       513   412   428
      500 521 424 469 500 522 459 529
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 505 422
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

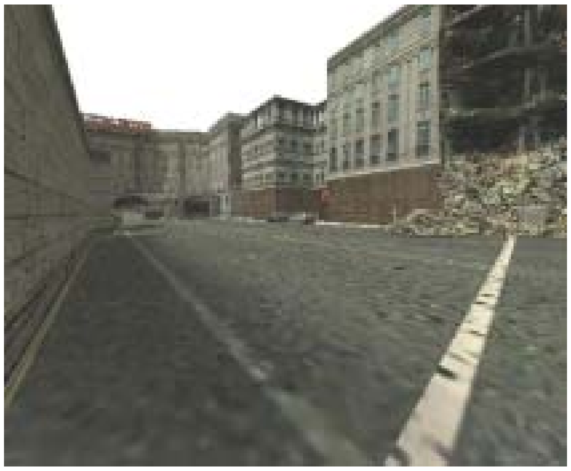
```
FILENAME: group4_2.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                  3 185        194   304   313
      180 201 310 335 180 202 332 367
2 3               1 3 2                  2 286        293   306   312
      284 296 312 324 285 296 319 336
3 3               1 3 2                  2 641        652   302   314
      638 652 310 334 639 654 332 362
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 192 320
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
70
```

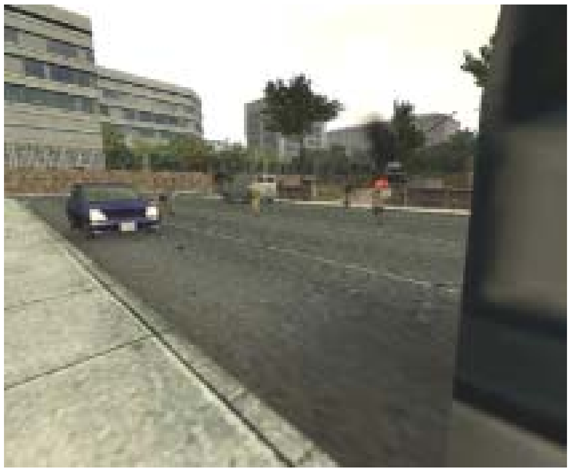
```
FILENAME: group4_3.jpg
***********************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                 3 0 0 0 0
      169 190 318 362 0           0     0     0
2 3             1 3 2                 2 0 0 0 0
      240 252 326 346 0           0     0     0
3 3             1 3 2                 2 0 0 0 0
      601 614 310 340 0           0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 1
Coordinates of Shot: 174 326
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
70
```

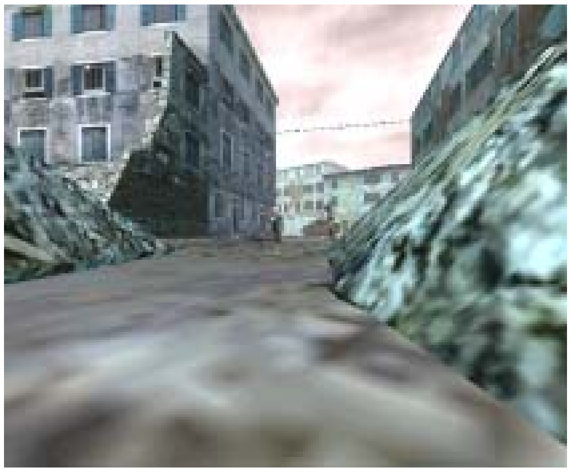
```
FILENAME: group4_4.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 229       240   288   297
      233 263 292 310 240 268 303 329
2 3             1 3 2                   2 382       394   271   283
      381 399 279 304 384 398 296 329
3 3             1 3 2                   2 0 0 0 0
      523 536 268 282 0            0     0     0
4 3             1 3 2                   2 577       586   294   305
      572 594 303 325 576 593 322 339
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 0 0
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
70
```

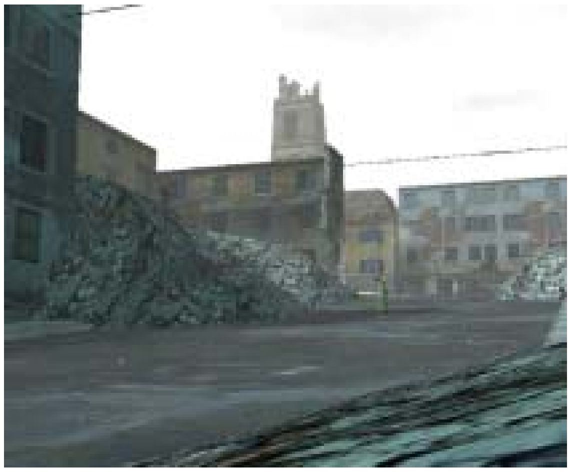
```
FILENAME: group5_1.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 416       427   314   326
      412 437 323 354 417 436 350 368
2 3             1 3 2                   2 502       510   301   312
      498 512 310 334 504 515 331 363
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 503 308
AimPoint: head

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
70
```

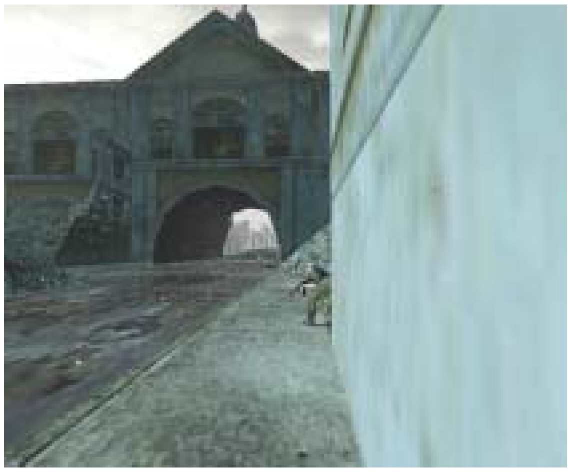
```
FILENAME: group5_2.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
-------------------------------------------------------------------------
-------------------------------------------------------------------------
-------------
1 2               3 2 1                    3 245       252   278   286
      242 258 283 307 245 258 302 334
2 3               1 3 2                    2 583       592   413   422
      578 599 419 446 582 603 445 486
-------------------------------------------------------------------------
-------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 591 424
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
80
```

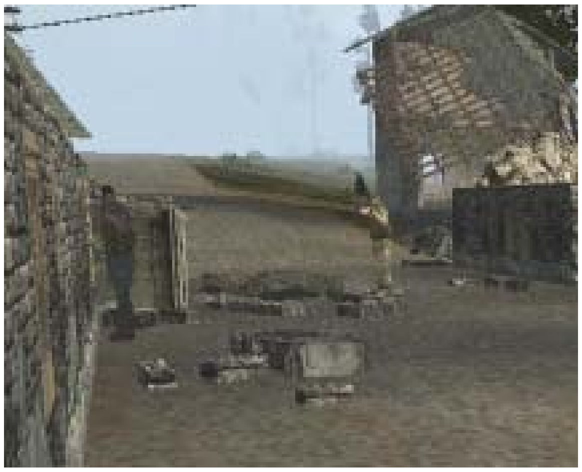
```
FILENAME: group5_3.jpg
***********************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
-----------------------------------------------------------------------
-----------------------------------------------------------------------
-------------
1 2             3 2 1                   3 0 0 0 0
      388 406 384 403 0           0     0    0
2 3             1 3 2                   2 466       487   396   417
      469 516 410 449 468 514 443 498
-----------------------------------------------------------------------
-----------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 477 415
AimPoint: head

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

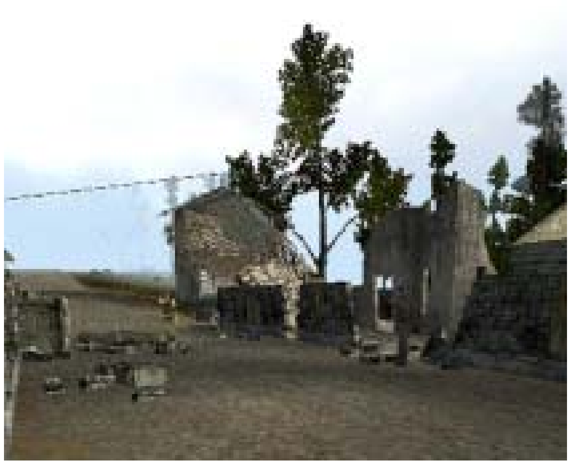
```
FILENAME: group5_4.jpg
***********************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2               3 2 1                 3 147       173   280   309
      141 207 306 405 157 206 404 520
2 3               1 3 2                 2 567       588   299   319
      565 605 310 380 567 608 372 442
3 3               1 3 2                 2 736       746   254   265
      729 753 266 283 0            0     0     0
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 2
Coordinates of Shot: 577 320
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

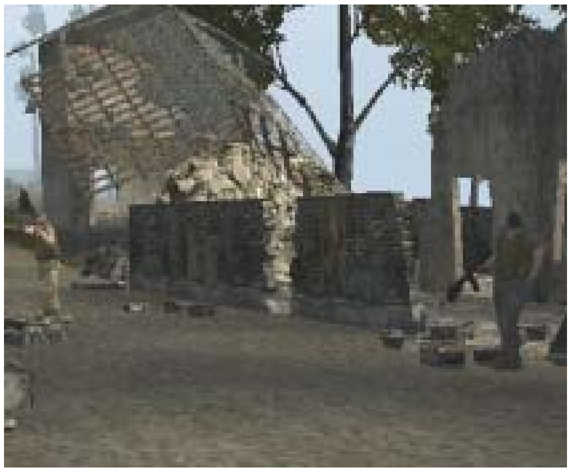
```
FILENAME: group5_5.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 247       261   459   470
      242 270 466 501 247 270 499 537
2 3             1 3 2                   2 350       366   437   448
      0 0 0 0 0 0 0 0
3 3             1 3 2                   2 610       626   447   465
      605 640 463 519 605 636 512 571
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: 3
Coordinates of Shot: 614 470
AimPoint: torso

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

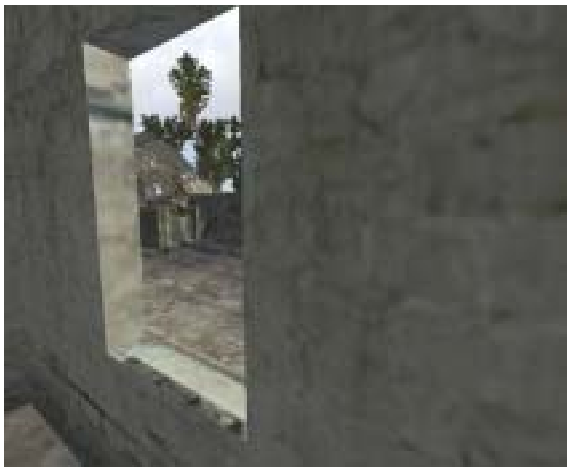
```
FILENAME: group5_6.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 3              1 3 2                  2 48        71    323   345
      41 89 340        414   48 87 410        484
2 3              1 3 2                  2 237       253   274   287
      228 257 287 305 0             0     0     0
3 3              1 3 2                  2 782       811   320   350
      760 834 339 449 752 813 426 567
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 0 0
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Double Tap
p_hit:
100
```

```
FILENAME: group5_7.jpg
************************
Target  Exposure  Visibility  Distance    Posture  FiringStatus  h_xmin
h_xmax  h_ymin  h_ymax  t_xmin  t_xmax  t_ymin  t_ymax  l_xmin  l_xmax
l_ymin  l_ymax
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
1 2             3 2 1                   3 208       224   301   312
      0 0 0 0 0 0 0 0
2 3             1 3 2                   2 267       278   288   300
      265 286 298 334 268 286 328 365
------------------------------------------------------------------------
------------------------------------------------------------------------
-------------
```



```
SME Target Selection Results
----------------------------
TargetSelected: none
Coordinates of Shot: 50 342
AimPoint: miss

After-Action Review
-------------------
M4Mode:
Three-Round Burst
p_hit:
80
null
```

Appendix B: FiTKAT User Manual

First Target Knowledge Acquisition Tool (FiTKAT) User Manual

Section 1 – Installing and Running FiTKAT

1. Ensure that you are running an OS that has a Java run-time environment installed. You can check to see if this is the case by typing "java –version" at a terminal or DOS command prompt.

2. If you wish to run this tool from your hard drive (and not from the included CD-ROM), ensure that you extract the following files to an empty di rectory. Each of these files are included in the self-extracting zip file fitkat.exe

   - *start.bat*
   - *MainApp.class*
   - *UserInfoWindow.class*
   - *TargetWindow.class*
   - *AfterActionReviewWindow.class*
   - *image_params.dat*
   - *all* .jpg *files referred to within image_params.dat (group1_1.jpg …)*

3. Ensure that your desktop resolution is at least 1152x864 pixels to ensure FiTKAT can fully display each window

4. If you have edited the *image_params.dat* file (see Section 3), ensure that each image file listed exists in the /bin directory. Also, check the file to make sure each listing adheres to the correct format as shown in the provided *image_params.dat* file.

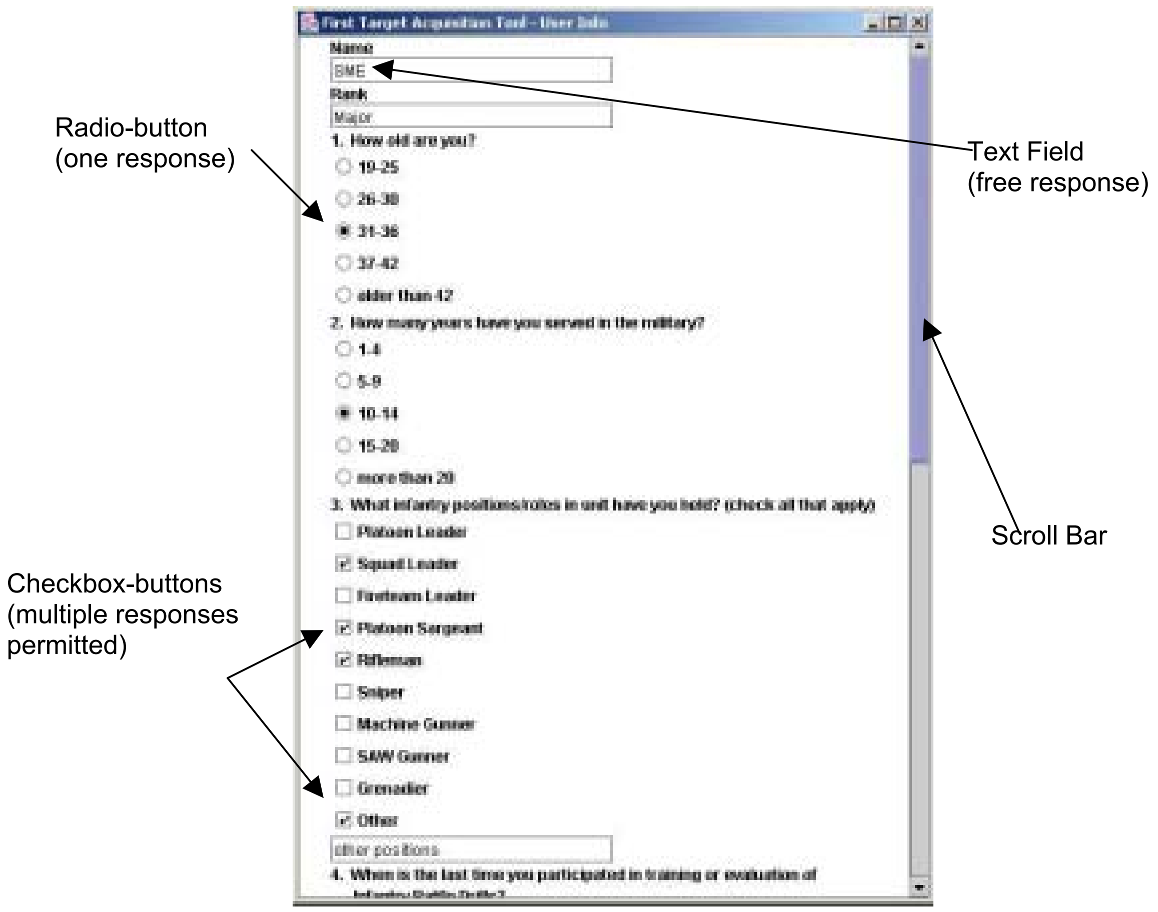
5. From the /bin directory of your CD-ROM, (or from the empty directory created on your hard drive) execute 'start.bat'.

Section 2 – Working with FiTKAT

FiTKAT includes three knowledge-acquisition windows that accept user data: the questionnaire, drill section, and after-action review section. The SME can navigate through these windows using a standard 2-button mouse and keyboard.

Section 2.1 - SME Questionnaire

The opening window displayed by FiTKAT is a questionnaire that asks the SME basic questions about his military background. The SME is not required to provide answers to any of these questions; however he is encouraged to submit a complete survey. To complete this questionnaire, navigate the mouse to the answer blanks for each question. For text answers, click in the white space provided and type in your response. For multiple-choice questions, simply click on the blank button indicating your answer. If a question permits multiple answers, your selections will display as check marks instead of filled-in circles. Use the scroll bar on the right-hand side of the window to navigate to the latter questions in the survey. When you are finished, click the 'Submit' button to proceed to the drill section of FiTKAT.



Name
SME
Rank
Major
1. How old are you?
○ 19-25
○ 26-30
● 31-36
○ 37-42
○ older than 42
2. How many years have you served in the military?
○ 1-4
○ 5-9
● 10-14
○ 15-20
○ more than 20
3. What infantry positions/roles in unit have you held? (check all that apply)
☐ Platoon Leader
☑ Squad Leader
☐ Fireteam Leader
☑ Platoon Sergeant
☑ Rifleman
☐ Sniper
☐ Machine Gunner
☐ SAW Gunner
☐ Grenadier
☑ Other
other positions
4. When is the last time you participated in training or evaluation of

Figure B1 – The Questionnaire Window

Section 2.2 - Drill Section

For the drill section, FiTKAT will display a list of images in the order that they are provided in the *image_params.dat* file (see Section 3). When an image appears, use the left-mouse button to fire on the target that you would most likely fire upon first if presented the situation in real life. Be sure to click (only once) on the target at the precise point on his body where you would most likely fire. After you have made a selection, refrain from clicking until a new image has loaded into the drill window.

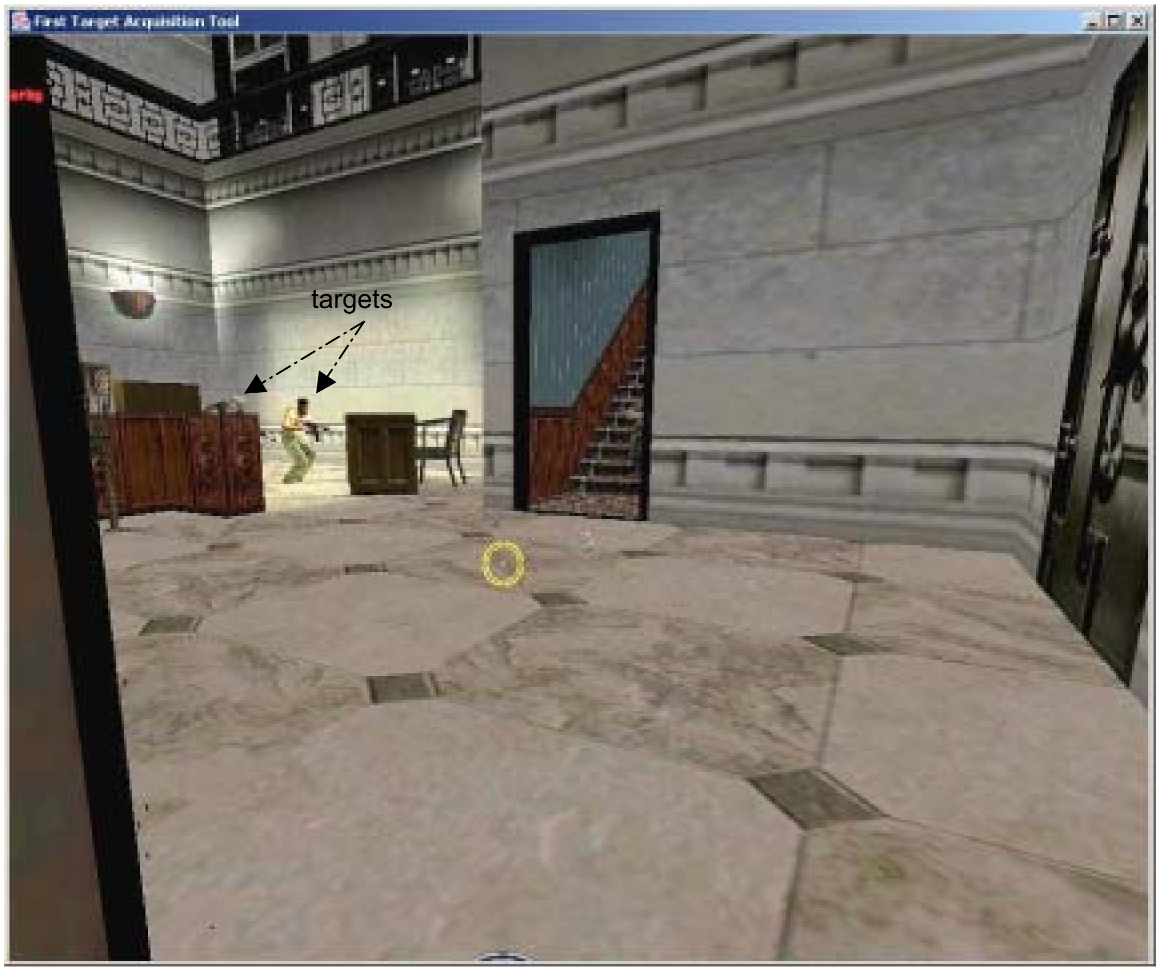
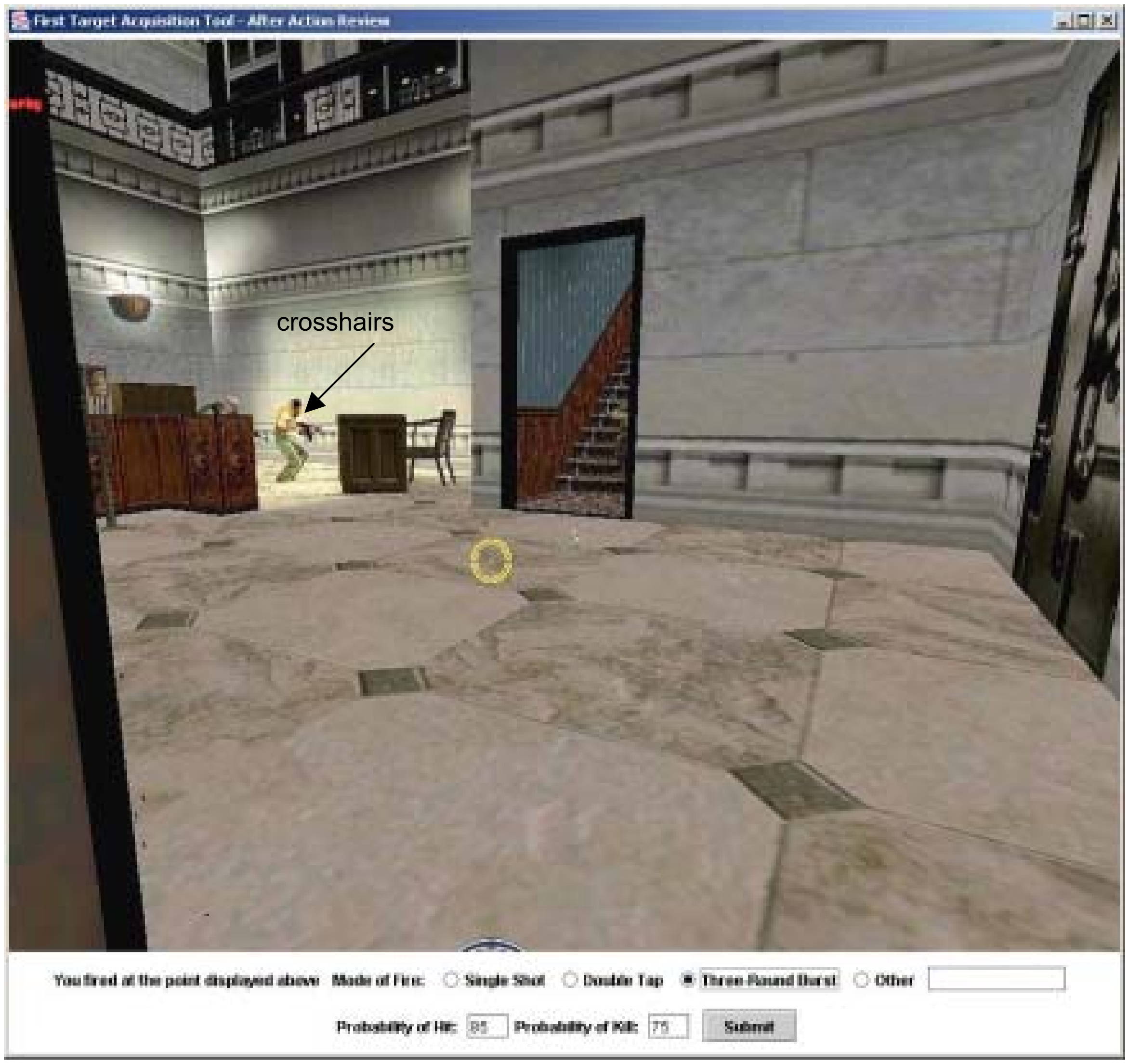


Figure B2 –The Drill Window

Section 2.3 – The After-Action Review Window

After FiTKAT has displayed each image, the After-Action Review window instantiates. Here, each image will be displayed a second time with a set of crosshairs indicating where the user has fired. Below the image is a set of questions designed to probe the SME for more information regarding his selection. Use the mouse and keyboard to fill in the appropriate responses. Feel free to leave questions blank if you wish. When you have completed your responses for the image displayed, click the ‘Submit’ button to proceed to the next image.



You fired at the point displayed above Mode of Fire: Single Shot Double Tap [✓ Three-Round Burst] Other

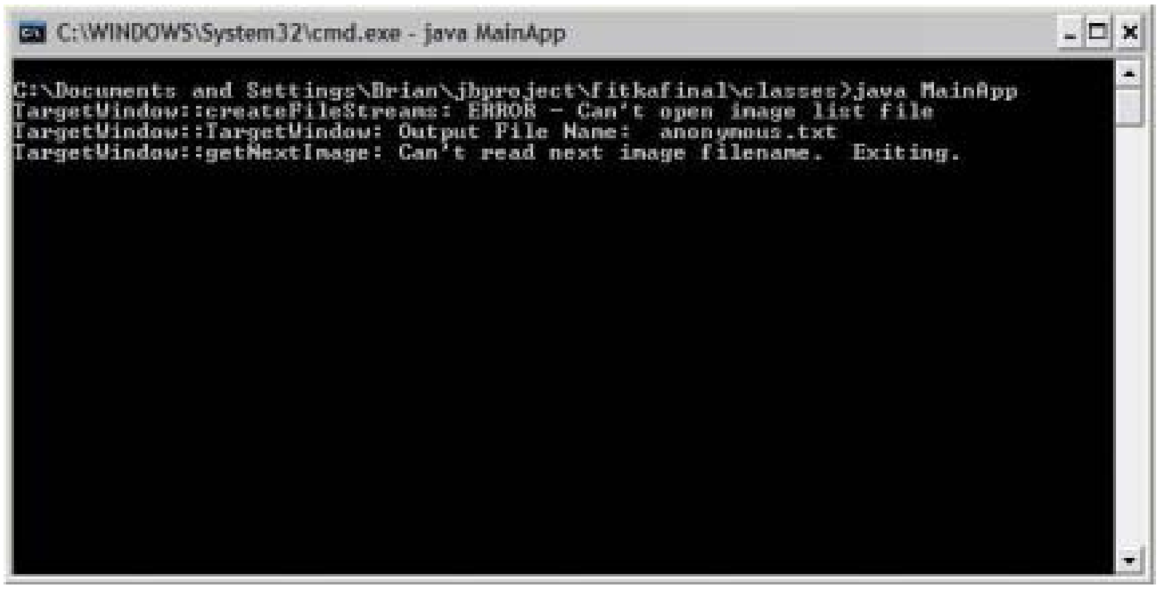
Probability of Hit: 85 Probability of Kill: 75

Figure B3 – The After-Action Review Window

Section 3 – The Console Window

During execution, a console window in which you executed *start.bat* will be displaying messages about the current run. If you encounter a problem while running FiTKAT, check this window to see if any error messages have printed. If an error has occurred during your run, the reason for that error will likely be displayed in this window.

In Figure B4, FiTKA has executed without the *image_params.dat* file. The program is able to execute the user survey, but when it begins loading images for the drill section it runs into the error above. The *TargetWindow::createFileStreams* text represents the class and method in which the error has occurred.



```
C:\Documents and Settings\Brian\jbproject\fitkafinal\classes>java MainApp
TargetWindow::createFileStreams: ERROR - Can't open image list file
TargetWindow::TargetWindow: Output File Name:  anonymous.txt
TargetWindow::getNextImage: Can't read next image filename.  Exiting.
```

Figure B4 – The Console Window and an Example Error Message

Section 4 – Modifying Target Selection Images with *image_params.dat*

The *image_params.dat* file contains both a listing of each image to be displayed by FiTKAT along with the coordinates of each target depicted by t hose images. More specifically, the locations of the head, torso, and legs of tar get are each identified within *image_params.dat* as a 4-tuple that defines a coordinate 'box' around that region (see figure B5 below). These box coordinates are actually pixel positions within the image file. In figure B5, for instance, the coordinate (t_xmin, t_ymin) represents the top-left vertex of the bl ue torso box, whereas (t_xmax, t_ymax) represents the bottom-right vertex.

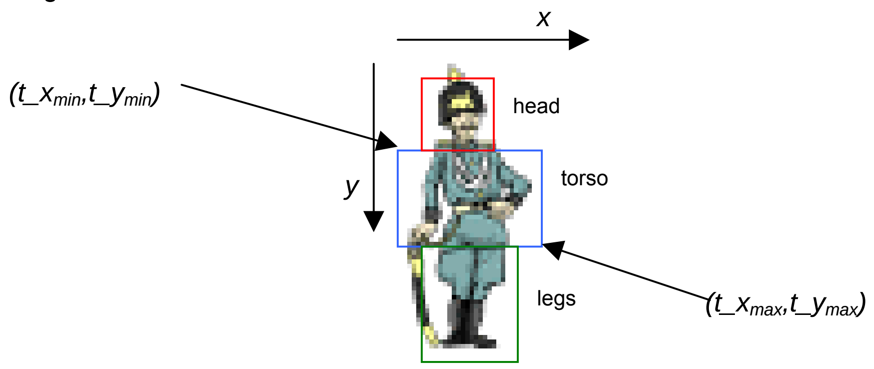


Figure B5 – Defining the Body-Part Regions of a Target with 4-Tuple 'Boxes'

In addition to these positions, *image_params.dat* also contains fields for the visibility, distance, exposure, posture, and firing status of the target in relation to the environment in which he is seen. In the provided *image_params.dat*, each field takes on a value between 1 and 3 based on the degree to which eacj target portrays the trait.

The fields are an attempt to portray a complete description of each target's threat within a given image. When the subject-matter expert selects a target, that selection can be mapped to the values of these fields in relation to those of the non-selected targets. As the FiTKAT program does not do any internal computations with thes e values, the values can be modified to span any desired numerical range or orientation.

To add an image to be displayed by FiTKAT dur ing the drill exercise and AAR, simply add the filename and image information to *image_params.dat* using the exact format used in the provided file. Note that you can designate where in the sequence this image is displayed, as FiTKAT reads and presents each image in the exact order it is presented by *image_params.dat*.

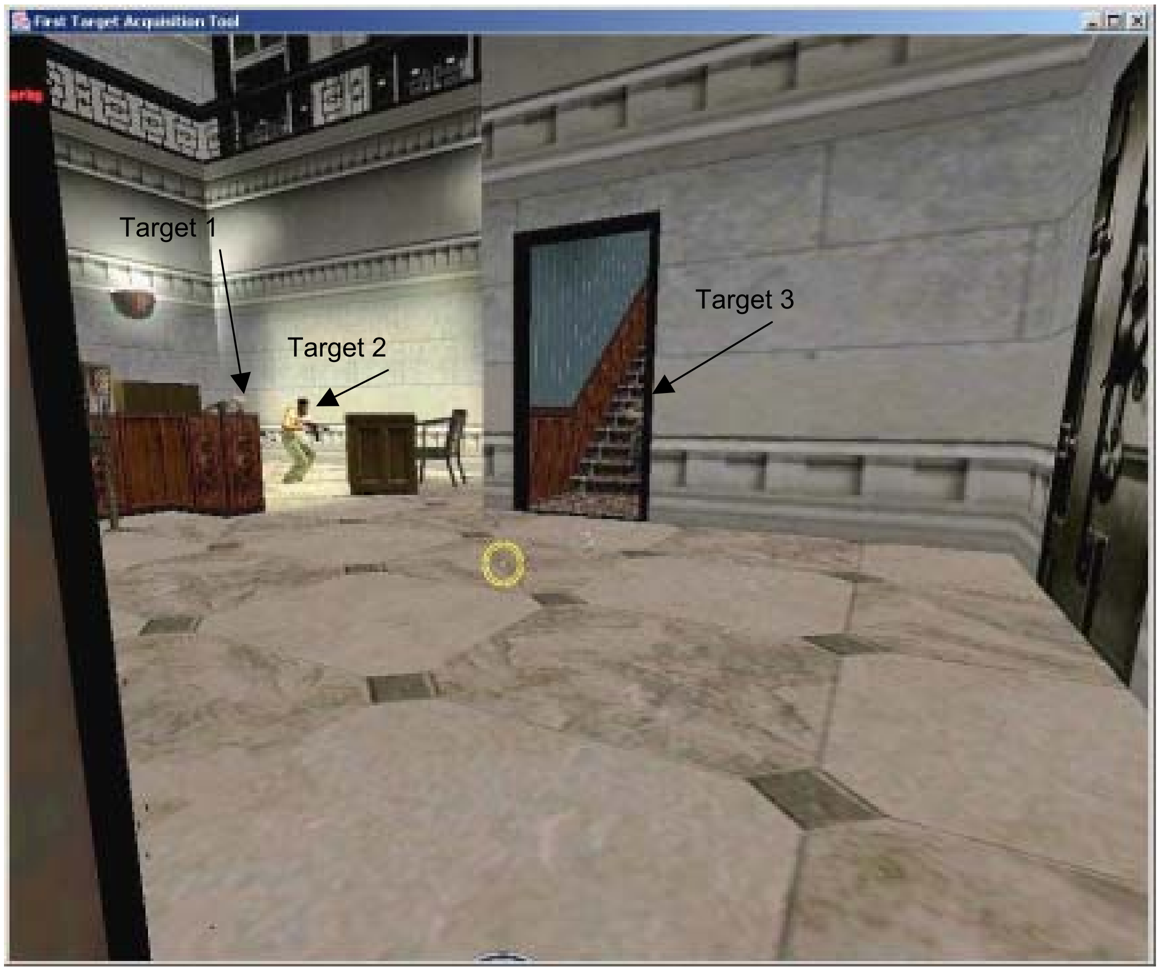
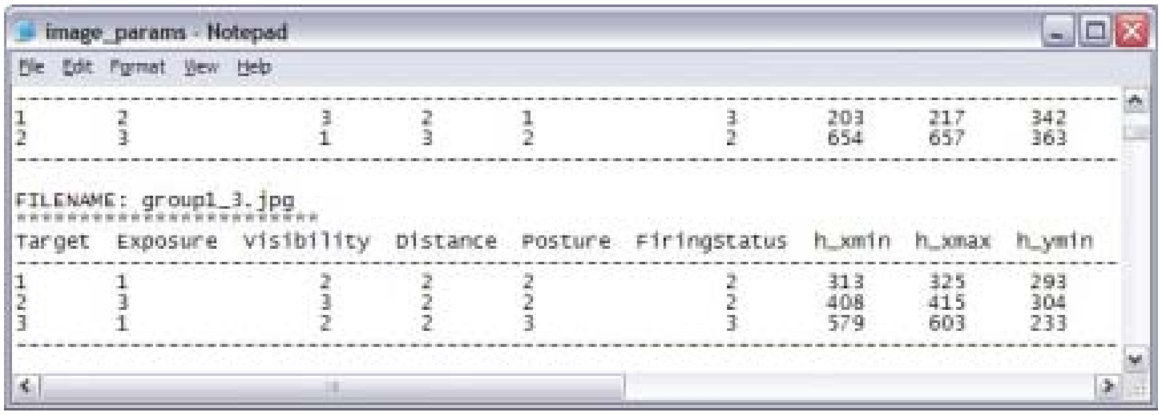


Figure B6 – A Sample Slide from the Drill Section



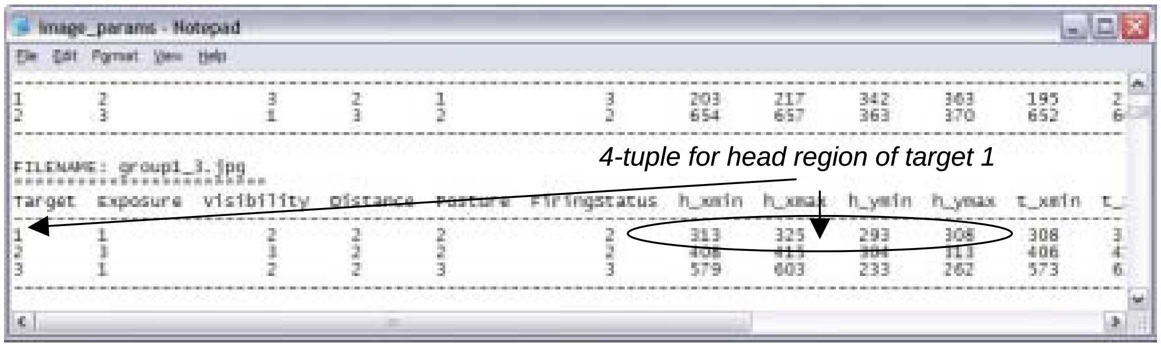
```
------------------------------------------------------------------------------------------------
1       2             3       2       1             3       203      217      342
2       3             1       3       2             2       654      657      363
------------------------------------------------------------------------------------------------

FILENAME: group1_3.jpg
************************
Target  Exposure  Visibility  Distance  Posture  FiringStatus  h_xmin  h_xmax  h_ymin
------------------------------------------------------------------------------------------------
1       1             2       2       2             2       313      325      293
2       3             3       2       2             2       408      415      304
3       1             2       2       3             3       579      603      233
------------------------------------------------------------------------------------------------
```

Figure B7 – Defining the Targets and their Parameters

When adding an image, it is necessary to include the locations of each target along with the image name. To identify these positions using the FiTKAT tool, first add the image name as the first image to be displayed. Provide values for visibility, posture, etc. (for each target) and enter 0 for all coordinate values needed. Figure B7 is an example *image_params.dat* file with the parameters of image *group1_3.jpg* shown. Figure B6 is an illustration of this image with each of its three targets identified. In Figure B7, note that a value for the exposure, visibility, etc. is assigned to each of the three targets – for example, target 2 is assigned visibility = 3 (most visible) whereas target 3 is given visibility = 2.

After these values have been assigned for each target, execute FiTKAT and proceed to the image you have added. Right-click on the upper-left and lower-right boundaries of the boxes you wish to create for each region of your targets. Note that after each click, a set of coordinates will show up in the FiTKAT console window. The coordinates of the upper-left region will correspond to x_{min} and y_{min} for the appropriate region of the target you are defining, while the lower-right coordinates translate to its x_{max} and y_{max} values. These values can be plugged into the appropriate spaces within *image_params.dat*.


image_params - Notepad
File Edit Format View Help
4-tuple for head region of target 1

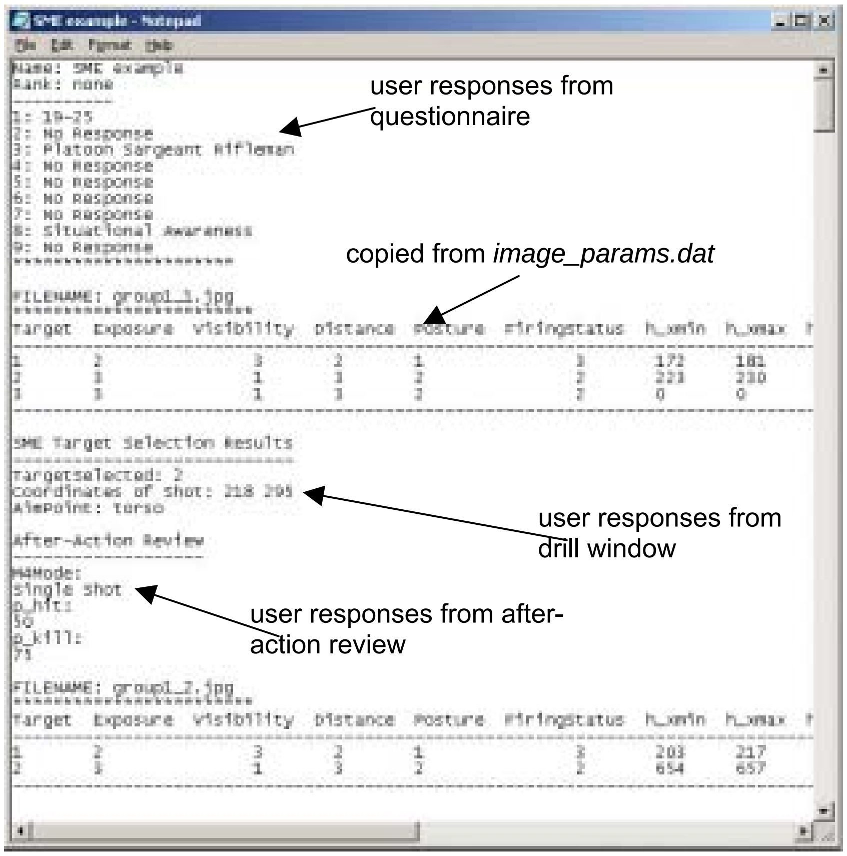
```
-------------------------------------------------------------------------------------------------------
1      2           3       2      1           3       203     217     342     363     195     2
2      3           1       3      2           2       654     657     363     370     652     6
-------------------------------------------------------------------------------------------------------

FILENAME: group1_3.jpg
==========================
Target  Exposure  Visibility  Distance  Posture  FiringStatus  h_xmin  h_xmax  h_ymin  h_ymax  t_xmin  t_
-------------------------------------------------------------------------------------------------------
1      1           2       2      2           2       313     325     293     308     308     3
2      3           3       2      2           2       408     415     304     313     406     4
3      1           2       2      3           3       579     603     233     262     573     6
-------------------------------------------------------------------------------------------------------
```

Figure B8 – The 4-Tuple Boxes in *image_params.dat*

Section 5 – Retrieving Knowledge Obtained from FiTKAT

Each time the FiTKAT application is run, a text file is created and saved as *username*.txt (where *username* is the name provided by the SME in the questionnaire). At the beginning of this file are the responses that user submitted in the leading questionnaire. What follows is a copy of the *image_params.dat* file with added values containing the coordinates and body positions of the shot, along with the responses given to the after-action review for each image.


SME example - Notepad
File Edit Format Help
user responses from questionnaire
copied from *image_params.dat*
user responses from drill window
user responses from after-action review

```
Name: SME example
Rank: none
-----------
1: 19-25
2: No Response
3: Platoon Sargeant Rifleman
4: No Response
5: No Response
6: No Response
7: No Response
8: Situational Awareness
9: No Response
***********************

FILENAME: group1_1.jpg
*************************
Target  Exposure  Visibility  Distance  Posture  FiringStatus  h_xmin  h_xmax  h
-------------------------------------------------------------------------------------
1       2         3           2         1        3             172     181
2       3         1           3         2        2             223     230
3       3         1           3         2        2             0       0
-------------------------------------------------------------------------------------

SME Target Selection Results
------------------------------
TargetSelected: 2
Coordinates of Shot: 218 295
AimPoint: torso

After-Action Review
---------------------
M4Mode:
Single Shot
p_hit:
50
p_kill:
75

FILENAME: group1_2.jpg
*************************
Target  Exposure  Visibility  Distance  Posture  FiringStatus  h_xmin  h_xmax  h
-------------------------------------------------------------------------------------
1       2         3           2         1        3             203     217
2       3         1           3         2        2             654     657
-------------------------------------------------------------------------------------
```

Figure B7 – *username*.txt

Appendix C: FiTKAT Souce Code

MainApp.java

```
/*
 * Title:       MainApp
 * Description: This is the FiTKAT main  application.  It
 *              calls and sizes each window to be used
 *              (UserInfoWindow, TargetWindow,
 *                 AfterActionReviewWindow)
 * Author:      Soar Technology, Inc.
 * Version:     1.1
 * Date:        11.24.03
 */

import javax.swing.*;
import java.awt.event.*;

public class MainApp
{
  public static void main(String [] args)
  {
    // create the user info window and define size and orientation
    UserInfoWindow infoWindow = new UserInfoWindow("FiTKAT - User
Info");
    infoWindow.setSize(900, 1050);
    infoWindow.setLocation(300, 50);
    infoWindow.setVisible(true);

    // hold until info window is closed
    while (infoWindow.isVisible()) {}

    // create the first target window
    TargetWindow targetWindow = new TargetWindow("FiTKAT - Drill
Excercise", infoWindow.getIoFileName());
    targetWindow.addWindowListener(new WindowAdapter()
    {
      public void windowClosing(WindowEvent e)
      {
        System.exit(0);
      }
    });
    targetWindow.setVisible(true);

    // hold until window closed
    while (targetWindow.isVisible()){}

    // exit program if file error occured
    if (targetWindow.didRunCorrectly()== false)
      System.exit(0);

    // create the after action review window
    AfterActionReviewWindow aarWindow = new AfterActionReviewWindow
        ("FiTKAT - After Action Review", infoWindow.getIoFileName());

    aarWindow.addWindowListener(new WindowAdapter()
    {
      public void windowClosing(WindowEvent e)
      {
        System.exit(0);
      }
    });

    // hold until window closed
    while (aarWindow.isVisible()) {}

    System.exit(0);
  }
}
```

UserInfoWindow.java

```
/*
 * Title:       UserInfoWindow
 * Description: This is the Window JFrame that contains the
 *                 user survey.  This Frame is responsible for
 *                displaying the survey and recording user
 *              respnoses by writing them to a pre-existing
 *                 file containing the list and description
 *              of each image to be displayed.
 * Copyright:   Copyright (c) 2003
 * Author:      Soar Technology, Inc.
 * Version:     1.1
 * Date:        11.24.03
 */

import java.awt.*;
import javax.swing.*;
import java.io.*;
import java.awt.event.*;

public class UserInfoWindow extends JFrame implements ActionListener,
ItemListener
{
  //JFrame stuff
  Container contentPane;
  UserInfoWindowPanel panel,column1panel,column2panel;

  // file names and streams
  FileWriter ioFileStream;
  static String imageInfoFileName = "image_params.dat";
  String ioFileName;

  // buttons, checkboxes and textfields
  JTextField userName;
  JTextField userRank;

  ButtonGroup question1answers;
  JRadioButton q1a, q1b, q1c, q1d, q1e;
  ButtonGroup question2answers;
  JRadioButton q2a, q2b, q2c, q2d, q2e;
  JCheckBox q3a, q3b, q3c, q3d, q3e, q3f, q3g, q3h, q3i, q3j;
  JTextField q3jText;
  ButtonGroup question4answers;
  JRadioButton q4a, q4b, q4c, q4d;
  ButtonGroup question5answers;
  JRadioButton q5a, q5b, q5c, q5d;
  ButtonGroup question6answers;
  JRadioButton q6a, q6b, q6c, q6d;
  ButtonGroup question8answers;
  JTextField q7Text;
  JRadioButton q8a, q8b, q8c, q8d;
  JTextField q8dText;
  ButtonGroup question9answers;
  JRadioButton q9a, q9b, q9c, q9d;

  JButton submitButton;
```

```
/* Method: UserInfoWindow
   Description: This is the Constructor for UserInfoWindow.  It creates
the frame along with
                the scrolling feature and it calls the function to
display each question and
                answer field
*/
  UserInfoWindow(String title)
  {
    // call constructor for parent class
    super(title);

    // create frame and add content panel
    contentPane = getContentPane();
    panel = new UserInfoWindowPanel();

    contentPane.add(panel);

    // add scroll pane for frame
    JScrollPane jscrollpane = new JScrollPane(panel,

ScrollPaneConstants.VERTICAL_SCROLLBAR_ALWAYS,

ScrollPaneConstants.HORIZONTAL_SCROLLBAR_NEVER);
    contentPane.add(jscrollpane);

    // add question and answer fields to panel
    addFields();
  }

/* Method: addFields
   Description: This method adds each question and answer field to the
panel to be displayed.
*/
  private void addFields()
  {
    // create a layout for the questions

    panel.setLayout(new GridLayout(1,2));
    column1panel = new UserInfoWindowPanel();
    column1panel.setLayout(new GridLayout(30,0));
    column2panel = new UserInfoWindowPanel();
    column2panel.setLayout(new GridLayout(30,0));

    // Name and Rank fields
    UserInfoWindowPanel namepanel = new UserInfoWindowPanel();
    GridLayout nameRankLayout = new GridLayout(2,2);
    namepanel.setLayout(nameRankLayout);

    JLabel userNameLabel = new JLabel("Name");
    userName = new JTextField(10);
    namepanel.add(userNameLabel);
    namepanel.add(userName);

    UserInfoWindowPanel rankpanel = new UserInfoWindowPanel();
    rankpanel.setLayout(nameRankLayout);
    JLabel userRankLabel = new JLabel("Rank");
    userRank = new JTextField(10);
    rankpanel.add(userRankLabel);
    rankpanel.add(userRank);
    column1panel.add(namepanel);
    column1panel.add(rankpanel);

    // question 1
    JLabel question1 = new JLabel("1.  How old are you?");
    column1panel.add(question1);

    question1answers = new ButtonGroup();
    q1a = new JRadioButton("19-25");
    q1a.setBackground(Color.white);
    q1b = new JRadioButton("26-30");
    q1b.setBackground(Color.white);
    q1c = new JRadioButton("31-36");
    q1c.setBackground(Color.white);
    q1d = new JRadioButton("37-42");
    q1d.setBackground(Color.white);
    q1e = new JRadioButton("older than 42");
    q1e.setBackground(Color.white);
    // add each answer to buttongroup
    question1answers.add(q1a);
    question1answers.add(q1b);
    question1answers.add(q1c);
    question1answers.add(q1d);
    question1answers.add(q1e);
    // add item listener for each button in group
    q1a.addItemListener(this);
    q1b.addItemListener(this);
    q1c.addItemListener(this);
    q1d.addItemListener(this);
    q1e.addItemListener(this);

    column1panel.add(q1a);
    column1panel.add(q1b);
    column1panel.add(q1c);
    column1panel.add(q1d);
    column1panel.add(q1e);

    // question 2
    JLabel question2 = new JLabel("2.  How many years have you served in
the military?");
    column1panel.add(question2);

    question2answers = new ButtonGroup();
    q2a = new JRadioButton("1-4");
    q2a.setBackground(Color.white);
    q2b = new JRadioButton("5-9");
    q2b.setBackground(Color.white);
    q2c = new JRadioButton("10-14");
    q2c.setBackground(Color.white);
    q2d = new JRadioButton("15-20");
    q2d.setBackground(Color.white);
    q2e = new JRadioButton("more than 20");
    q2e.setBackground(Color.white);
    question2answers.add(q2a);
    question2answers.add(q2b);
    question2answers.add(q2c);
    question2answers.add(q2d);
    question2answers.add(q2e);
    q2a.addItemListener(this);
    q2b.addItemListener(this);
    q2c.addItemListener(this);
    q2d.addItemListener(this);
    q2e.addItemListener(this);

    column1panel.add(q2a);
    column1panel.add(q2b);
    column1panel.add(q2c);
    column1panel.add(q2d);
    column1panel.add(q2e);

    // question 3
    JLabel question3 = new JLabel("3.  What infantry positions/roles in 
unit have you held? (check all that apply)");
    column1panel.add(question3);

    q3a = new JCheckBox("Platoon Leader");
    q3a.setBackground(Color.white);
    q3b = new JCheckBox("Squad Leader");
    q3b.setBackground(Color.white);
    q3c = new JCheckBox("Fireteam Leader");
    q3c.setBackground(Color.white);
    q3d = new JCheckBox("Platoon Sargeant");
    q3d.setBackground(Color.white);
    q3e = new JCheckBox("Rifleman");
    q3e.setBackground(Color.white);
    q3f = new JCheckBox("Sniper");
    q3f.setBackground(Color.white);
    q3g = new JCheckBox("Machine Gunner");
    q3g.setBackground(Color.white);
    q3h = new JCheckBox("SAW Gunner");
    q3h.setBackground(Color.white);
    q3i = new JCheckBox("Grenadier");
    q3i.setBackground(Color.white);
    q3j = new JCheckBox("Other");
    q3j.setBackground(Color.white);
    q3jText = new JTextField(20);

    q3a.addItemListener(this);
    q3b.addItemListener(this);
    q3c.addItemListener(this);
    q3d.addItemListener(this);
    q3e.addItemListener(this);
    q3f.addItemListener(this);
    q3g.addItemListener(this);
    q3h.addItemListener(this);
    q3i.addItemListener(this);
    q3j.addItemListener(this);


    column1panel.add(q3a);
    column1panel.add(q3b);
    column1panel.add(q3c);
    column1panel.add(q3d);
    column1panel.add(q3e);
    column1panel.add(q3f);
    column1panel.add(q3g);
    column1panel.add(q3h);
    column1panel.add(q3i);
    UserInfoWindowPanel q3jpanel = new UserInfoWindowPanel();
    q3jpanel.setLayout(new FlowLayout(FlowLayout.LEADING));
    q3jpanel.add(q3j);
    q3jpanel.add(q3jText);
    column1panel.add(q3jpanel);

    // question 4
    JLabel question4 = new JLabel("4.  When is the last time you
participated in training or evaluation of");
    column1panel.add(question4);

    JLabel question4b = new JLabel("      Infantry Battle Drills?");
    column1panel.add(question4b);

    question4answers = new ButtonGroup();
    q4a = new JRadioButton("Never");
    q4a.setBackground(Color.white);
    q4b = new JRadioButton("Less than 2 years ago");
    q4b.setBackground(Color.white);
    q4c = new JRadioButton("2-5 years ago");
    q4c.setBackground(Color.white);
    q4d = new JRadioButton("More than 6 years ago");
    q4d.setBackground(Color.white);
    question4answers.add(q4a);
    question4answers.add(q4b);
    question4answers.add(q4c);
    question4answers.add(q4d);
    q4a.addItemListener(this);
    q4b.addItemListener(this);
    q4c.addItemListener(this);
    q4d.addItemListener(this);

    column1panel.add(q4a);
    column1panel.add(q4b);
    column1panel.add(q4c);
    column1panel.add(q4d);

    // question 5
    JLabel question5 = new JLabel("5.  When is the last time you
participated in real-world execution of");
    column2panel.add(question5);

    JLabel question5b = new JLabel("      Infantry Battle Drills?");
    column2panel.add(question5b);

    question5answers = new ButtonGroup();
    q5a = new JRadioButton("Never");
    q5a.setBackground(Color.white);
    q5b = new JRadioButton("Less than 2 years ago");
    q5b.setBackground(Color.white);
    q5c = new JRadioButton("2-5 years ago");
    q5c.setBackground(Color.white);
    q5d = new JRadioButton("More than 6 years ago");
    q5d.setBackground(Color.white);
    question5answers.add(q4a);
    question5answers.add(q4b);
    question5answers.add(q4c);
    question5answers.add(q4d);
    q5a.addItemListener(this);
    q5b.addItemListener(this);
    q5c.addItemListener(this);
    q5d.addItemListener(this);

    column2panel.add(q5a);
    column2panel.add(q5b);
    column2panel.add(q5c);
    column2panel.add(q5d);

    // question 6
    JLabel question6 = new JLabel("6.  How many real fire fights have
you been in?");
    column2panel.add(question6);

    question6answers = new ButtonGroup();
    q6a = new JRadioButton("None");
    q6a.setBackground(Color.white);
    q6b = new JRadioButton("Less than 3");
    q6b.setBackground(Color.white);
    q6c = new JRadioButton("3-9");
    q6c.setBackground(Color.white);
    q6d = new JRadioButton("10 or more");
    q6d.setBackground(Color.white);
    question6answers.add(q6a);
    question6answers.add(q6b);
    question6answers.add(q6c);
    question6answers.add(q6d);
    q6a.addItemListener(this);
    q6b.addItemListener(this);
    q6c.addItemListener(this);
    q6d.addItemListener(this);

    column2panel.add(q6a);
    column2panel.add(q6b);
    column2panel.add(q6c);
    column2panel.add(q6d);

    // question 7
    JLabel question7 = new JLabel(
        "7.  What percentage of those fights were successful? ");
    q7Text = new JTextField(5);
    q7Text.setText("%");

    UserInfoWindowPanel q7panel = new UserInfoWindowPanel();
    q7panel.setLayout(new FlowLayout(FlowLayout.LEADING));
    q7panel.add(question7);
    q7panel.add(q7Text);

    column2panel.add(q7panel);

    // question 8
    JLabel question8 = new JLabel(
        "8.  What would you consider the most important aspect of
executing");
    column2panel.add(question8);

    JLabel question8b = new JLabel("      Infantry Battle Drills?");
    column2panel.add(question8b);

    question8answers = new ButtonGroup();
    q8a = new JRadioButton("Quick Response");
```

```
q8a.setBackground(Color.white);
q8b = new JRadioButton("Teamwork");
q8b.setBackground(Color.white);
q8c = new JRadioButton("Situational Awareness");
q8c.setBackground(Color.white);
q8d = new JRadioButton("Other");
q8d.setBackground(Color.white);
q8dText = new JTextField(20);
question8answers.add(q8a);
question8answers.add(q8b);
question8answers.add(q8c);
question8answers.add(q8d);
q8a.addItemListener(this);
q8b.addItemListener(this);
q8c.addItemListener(this);
q8d.addItemListener(this);

column2panel.add(q8a);
column2panel.add(q8b);
column2panel.add(q8c);

UserInfoWindowPanel q8dpanel = new UserInfoWindowPanel();
q8dpanel.setLayout(new FlowLayout(FlowLayout.LEADING));
q8dpanel.add(q8d);
q8dpanel.add(q8dText);
column2panel.add(q8dpanel);

// question 9
JLabel question9 = new JLabel(
    "9.  How many years of combat training have you received?");
column2panel.add(question9);

question9answers = new ButtonGroup();
q9a = new JRadioButton("None");
q9a.setBackground(Color.white);
q9b = new JRadioButton("Less than 2 years");
q9b.setBackground(Color.white);
q9c = new JRadioButton("2-5 years");
q9c.setBackground(Color.white);
q9d = new JRadioButton("6 years or more");
q9d.setBackground(Color.white);
question9answers.add(q9a);
question9answers.add(q9b);
question9answers.add(q9c);
question9answers.add(q9d);
q9a.addItemListener(this);
q9b.addItemListener(this);
q9c.addItemListener(this);
q9d.addItemListener(this);

column2panel.add(q9a);
column2panel.add(q9b);
column2panel.add(q9c);
column2panel.add(q9d);

// submitButton
submitButton = new JButton("Submit");
submitButton.setBackground(Color.white);
submitButton.addActionListener(this);
```

```
    column2panel.add(submitButton);
    panel.add(column1panel);
    panel.add(column2panel);

  }

/* Method: writeData
   Description:  this is a function to write a given string to the file
                 corresponding to the userDataFile buffer
*/
  private void writeData(String data)
  {
    try {
      ioFileStream.write(data);
    }
    catch (Exception E) {
      System.out.println("UserInfoWindow::writeData: ERROR - Can't write
to file");
    }
  }

/* Method: getFileName
   Description: this retrieves the fileName
*/
  public String getIoFileName()
  {
    return ioFileName;
  }

/* Method: actionPerformed
   Description:  This function is required for a frame to implement
ActionListener.
                 It fires when the submit button is pressed and records
all of the
                 answers indicated at the time of submittal to the i/o
file
*/
  public void actionPerformed(ActionEvent e)
  {
    /* when submit button is pressed, create a new file called and write
the user
       survey answers to that file.  Name the file *username*.txt */
    if (e.getSource() == submitButton) {
      try
      {
        if (userName.getText().length()==0) ioFileName =
"anonymous.txt";
        else ioFileName = userName.getText() + ".txt";

        ioFileStream = new FileWriter(userName.getText() + ".txt");
      }
      catch (Exception E) {
        System.out.println("UserInfoWindow::actionPerformed: ERROR -
Can't open output file");
      }

      // name and rank
      writeData("Name: ");
      writeData(userName.getText() + "\r\n");
      writeData("Rank: ");
      writeData(userRank.getText() + "\r\n");
      writeData("----------\r\n");

      // question 1
      writeData("1: ");
      if (q1a.isSelected())
        writeData("19-25 \r\n");
      else if (q1b.isSelected())
        writeData("26-30 \r\n");
      else if (q1c.isSelected())
        writeData("31-36 \r\n");
      else if (q1d.isSelected())
        writeData("37-42 \r\n");
      else if (q1e.isSelected())
        writeData("43 or higher \r\n");
      else writeData("No Response\r\n");

        // question 2
      writeData("2: ");
      if (q2a.isSelected())
        writeData("1 to 4 \r\n");
      else if (q2b.isSelected())
        writeData("5 to 9 \r\n");
      else if (q2c.isSelected())
        writeData("10 to 14 \r\n");
      else if (q2d.isSelected())
        writeData("15 - 20 \r\n");
      else if (q2e.isSelected())
        writeData("Over 20 \r\n");
      else writeData("No Response\r\n");

        // question 3
      writeData("3: ");
      if (q3a.isSelected())
        writeData("Platoon Leader ");
      if (q3b.isSelected())
        writeData("Squad Leader ");
      if (q3c.isSelected())
        writeData("Fireteam Leader ");
      if (q3d.isSelected())
        writeData("Platoon Sargeant ");
      if (q3e.isSelected())
        writeData("Rifleman ");
      if (q3f.isSelected())
        writeData("Sniper ");
      if (q3g.isSelected())
        writeData("Machine Gunner ");
      if (q3h.isSelected())
        writeData("SAW Gunner ");
      if (q3i.isSelected())
        writeData("Grenadier ");
      if (q3j.isSelected())
        writeData(q3jText.getText());
      if (q3a.isSelected()==false && q3b.isSelected()==false &&
q3c.isSelected()==false &&
          q3d.isSelected()==false && q3e.isSelected()==false &&
q3f.isSelected()==false &&
          q3g.isSelected()==false && q3h.isSelected()==false &&
q3i.isSelected()==false &&
          q3j.isSelected()==false)
```

```
  writeData("No Response");

writeData("\r\n");

// question 4
writeData("4: ");
if (q4a.isSelected())
  writeData("Never \r\n");
else if (q4b.isSelected())
  writeData("Less than 2 years ago \r\n");
else if (q4c.isSelected())
  writeData("2-5 years ago \r\n");
else if (q5c.isSelected())
  writeData("More than 6 years ago \r\n");
else writeData("No Response\r\n");

  // question 5
writeData("5: ");
if (q5a.isSelected())
  writeData("Never \r\n");
else if (q5b.isSelected())
  writeData("Less than 2 years ago \r\n");
else if (q5c.isSelected())
  writeData("2-5 years ago \r\n");
else if (q6c.isSelected())
  writeData("More than 6 years ago \r\n");
else writeData("No Response\r\n");

  // question 6
writeData("6: ");
if (q4a.isSelected())
  writeData("None \r\n");
else if (q4b.isSelected())
  writeData("Less than 3 \r\n");
else if (q4c.isSelected())
  writeData("3-9 \r\n");
else if (q5c.isSelected())
  writeData("10 or more \r\n");
else writeData("No Response\r\n");

writeData("7: ");
if (q7Text.getText().charAt(0) == '%')
  writeData("No Response\r\n");
else writeData(q7Text.getText() + "\r\n");

// question 8
writeData("8: ");
if (q8a.isSelected())
  writeData("Quick Response \r\n");
else if (q8b.isSelected())
  writeData("Teamwork  \r\n");
else if (q8c.isSelected())
  writeData("Situational Awareness \r\n");
else if (q8d.isSelected()) {
  writeData("Other: ");
  writeData(q8dText.getText() + "\r\n");
}
else writeData("No Response\r\n");

// question 9
```

```
      writeData("9: ");
      if (q9a.isSelected())
        writeData("None \r\n");
      else if (q9b.isSelected())
        writeData("Less than 2 years \r\n");
      else if (q9c.isSelected())
        writeData("2-5 years \r\n");
      else if (q9d.isSelected())
        writeData("More than 6 years \r\n");
      else writeData("No Response\r\n");

      writeData("*********************\r\n \r\n");

      try
      {
        ioFileStream.close();
      }
      catch (Exception E)
      {
        System.out.println("UserInfoWindow::actionPerformed: ERROR -
Can't close file");
      }
      this.setVisible(false);
    }
  }

  public void itemStateChanged(ItemEvent e) {}
}

class UserInfoWindowPanel extends JPanel
{
  UserInfoWindowPanel()
  {
    setBackground(Color.white);
  }
  public void paintComponent(Graphics g)
  {
    super.paintComponent(g);
    // write stuff in panel
  }
}
```

TargetWindow.java

```
/*
 * Title:       TargetWindow
 * Description: This is the Window JFrame that displays
 *               each image.  In addition, this Frame
 *                 is responsible for recording user target
 *                 selections for each image by writing
 *              them to a pre-existing file containing the
 *                 results of the user survey along with the
 *                 list and description of each image to be
 *                 displayed.
 * Author:      Soar Technology, Inc.
 * Version:     1.1
 * Date:        11.24.03
 */

import java.awt.*;
import javax.swing.*;
import javax.sound.sampled.*;
import java.awt.event.*;
import java.awt.image.*;
import java.io.*;
import java.io.RandomAccessFile.*;

public class TargetWindow extends JFrame implements MouseListener
{
  // constants
  static int MAX_TARGETS = 10;
  static int CHAR_TO_INT_OFFSET = -48;
  static int NUM_BODY_AREAS = 3;
  static int head = 0;
  static int torso = 1;
  static int legs = 2;
  static int miss = 3;

  // jpanel
  FirstTargetWindowPanel panel;
  JLabel theImageLabel;
  Toolkit theToolKit;
  Container contentPane;

  // text fields
  String tempStr;
  String theImageName;
  String outputFileName;
  static String targetInfoFileName = "image_params.dat";

  // file streams
  RandomAccessFile outputFileStream;
  BufferedReader targetInfoStream;

  // internal vars
  int imageCount;
  int numTargets;
  int targetCount;
  int targetSelected;
  int aimPoint; // 0=head, 1=torso, 2=legs
  int aimCoordinateX;
  int aimCoordinateY;
  boolean ranCorrectly;

/* Method: TargetWindow
   Description:  This is the constructor for Target Window.  It
instantiates the window and
                 the mouse listeners for it.  In addition, it attempts
to open the file created
                 by UserInfoWindow that contains the results of the user
survey, and opens the
                 first image for viewing
*/
  TargetWindow(String title, String theFileName)
  {
    // call parent constructor
    super(title);
    ranCorrectly = true;

    outputFileName = theFileName;
    contentPane = getContentPane();

    // attempt to open file for writing
    try
    {
      createFileStreams();
    }
    catch (Exception e)
    {
      System.out.println("TargetWindow::TargetWindow: ERROR - The image
list file could not be read.");
      this.setVisible(false);
      ranCorrectly = false;
    }
    System.out.println("TargetWindow::TargetWindow: Output File Name:  "
+ outputFileName);

    // initialize image count and retrieve first image
    getNextImage();
    imageCount = 1;
  }

/* Method: getNextImage
   Description:  This method retrieves the next image from the
input/output file to be
                 displayed
*/

  private int getNextImage()
  {
    // clear the frame
    contentPane.removeAll();
    ImageIcon tempImage;

    // attempt to read next image string from file
    try
    {
      tempStr = " ";
      while ((tempStr.startsWith("FILENAME:") ==
false)&&(tempStr!=null))
```

```
      {
        tempStr = targetInfoStream.readLine();
        outputFileStream.writeBytes(tempStr + "\r\n");
      }

      theImageName = tempStr.substring(10,tempStr.length());
    }
    catch (Exception E)
    {
      System.out.println("TargetWindow::getNextImage: Can't read next
image filename.  Exiting.");
      this.setVisible(false);
      return 0;
    }

    if (theImageName == null) // exit if no more images present in file
    {
      System.out.println("TargetWindow::getNextImage: No more images.
Exiting.");
      this.setVisible(false);

      // indicate failure to retrieve image
      return 0;
    }
    else // otherwise, place image in frame and repaint frame
    {
      // create new image from filename
      tempImage = new ImageIcon(theImageName);

      // debug image name
      System.out.print("TargetWindow::getNextImage: Image Displayed:
");
      System.out.println(theImageName);

      // create new imageLabel from image
      theImageLabel = new JLabel(tempImage, JLabel.NORTH_EAST);
      theImageLabel.addMouseListener(this);

      // resize frame to compensate for variable image sizes
      this.setSize(tempImage.getIconWidth()+10,
tempImage.getIconHeight()+20);

      // add image to frame and repaint
      contentPane.add(theImageLabel);
      repaint();
      show();

      // indicate success
      return 1;
    }
  }

/* Method: openImageListFile
   Description:  Attempts to open the input/output file that currently
stores the
                 results of the user survey as well as the list and
description of
                 all the images to be shown
*/
  private void createFileStreams()
  {
    // attempt to open the file
    try
    {
      // create new buffer for reading params file
      FileReader reader = new FileReader (targetInfoFileName);
      targetInfoStream = new BufferedReader(reader);

      // create output buffer for output file
      outputFileStream = new RandomAccessFile(outputFileName,"rw");
      outputFileStream.seek(outputFileStream.length());  // go to end of
file to write

    }
    catch (Exception e)
    {
      System.out.println("TargetWindow::createFileStreams: ERROR - Can't
open image list file");
      this.setVisible(false);
      ranCorrectly = false;
    }
  }

/* MouseListener functions that need to be included but have no
functionality */
  public void mousePressed(MouseEvent e){}
  public void mouseReleased(MouseEvent e) {}
  public void mouseEntered(MouseEvent e) {}
  public void mouseExited(MouseEvent e) {}
/*                *                  *                  *
*/

/* Method: MouseClicked
   Description:  Catches the event where the user has clicked the screen
and thus
                 has made a target selection for the current image.  The
coordinates
                 of the mouse click are stored in local memory and also
written to
                 the i/o file *username*.txt along with information of
where shot
                 occured (which enemy, where on body)
*/
  public void mouseClicked(MouseEvent e)
  {
    if ((e.getModifiers() & InputEvent.BUTTON1_MASK) ==
InputEvent.BUTTON1_MASK)
    {
      // record coordinates
      aimCoordinateX = e.getX();
      aimCoordinateY = e.getY();
      repaint();
      show();

      // sift through formatting
      tempStr = " ";
      while (tempStr.startsWith("-") == false)
        try
        {
          tempStr = targetInfoStream.readLine();
          outputFileStream.writeBytes(tempStr + "\r\n");
        }
        catch (Exception E) {}

      boolean selectedTargetFound = false;
      boolean noMoreTargets = false;
      targetCount = 1;
      targetSelected = 0;
      aimPoint = miss;
      while (!selectedTargetFound && !noMoreTargets)
      {
        tempStr = " ";
        try
        {
          tempStr = targetInfoStream.readLine();
          outputFileStream.writeBytes(tempStr + "\r\n");
        }
        catch (Exception E) {
          noMoreTargets = true;
        }
        //System.out.println("First number read as " +
charToInt(tempStr.charAt(0)));
        if (charToInt(tempStr.charAt(0)) != targetCount)
          noMoreTargets = true;
        else
        {
          // read in and crop all of the unused numbers (6 total)
          int numsread = 0;
          while (numsread < 6) {
            String numString = "";
            while (charIsANum(tempStr.charAt(0)) == false) // go through
blank spaces
              tempStr = tempStr.substring(1, tempStr.length());
            while (charIsANum(tempStr.charAt(0)) == true) { // get
digits in number
              char firstChar = tempStr.charAt(0);
              numString = numString + firstChar;
              tempStr = tempStr.substring(1, tempStr.length());
            }
            numsread++;
          }

          // boxes for head, torso, legs stored in a 3x4 entry array
          int[][] targetAreaBox = new int[NUM_BODY_AREAS][4];
          for (int partCnt = 0; partCnt < NUM_BODY_AREAS; partCnt++)
            for (int boxCnt = 0; boxCnt < 4; boxCnt++)
            {
              String boxBoundString = "";
              while (charIsANum(tempStr.charAt(0)) == false) { // go
through blank spaces
                tempStr = tempStr.substring(1, tempStr.length());
              }
              while (charIsANum(tempStr.charAt(0)) == true) { // get
digits in number
                char firstChar = tempStr.charAt(0);
                boxBoundString += firstChar;
                // might be at eol
                if (tempStr.length() > 1)
                  tempStr = tempStr.substring(1, tempStr.length());
                else
```

```
                  break;
                }
                targetAreaBox[partCnt][boxCnt] =
stringToInt(boxBoundString);
              }

            //System.out.println("Target shot at (" + aimCoordinateX + ",
" + aimCoordinateY + ")");

            // did we get 'em in the head?
            if (aimCoordinateX > targetAreaBox[head][0] &&
                aimCoordinateX < targetAreaBox[head][1] &&
                aimCoordinateY > targetAreaBox[head][2] &&
                aimCoordinateY < targetAreaBox[head][3]) {

              selectedTargetFound = true;
              targetSelected = targetCount;
              aimPoint = head;
              System.out.println("TargetWindow::mouseClicked: User
Selected Target " +
                                  targetCount + " at Coordinates (" +
aimCoordinateX +
                                  ", " + aimCoordinateY + ") (head)");
            }
            else // in the torso?
            if (aimCoordinateX > targetAreaBox[torso][0] &&
                aimCoordinateX < targetAreaBox[torso][1] &&
                aimCoordinateY > targetAreaBox[torso][2] &&
                aimCoordinateY < targetAreaBox[torso][3]) {
              selectedTargetFound = true;
              targetSelected = targetCount;
              aimPoint = torso;
              System.out.println("TargetWindow::mouseClicked: User
Selected Target " +
                                                targetCount + " at
Coordinates (" + aimCoordinateX +
                                                ", " + aimCoordinateY + ")
(torso)");

            }
            else // in the legs?
            if (aimCoordinateX > targetAreaBox[legs][0] &&
                aimCoordinateX < targetAreaBox[legs][1] &&
                aimCoordinateY > targetAreaBox[legs][2] &&
                aimCoordinateY < targetAreaBox[legs][3]) {
              selectedTargetFound = true;
              targetSelected = targetCount;
              aimPoint = legs;
              System.out.println("TargetWindow::mouseClicked: User
Selected Target " +
                                                targetCount + " at
Coordinates (" + aimCoordinateX +
                                                ", " + aimCoordinateY + ")
(legs)");

            }
            else // either we missed or we didn't hit this target
              targetCount++;
          }
        }
```

```
      try {
        // more formatting
        while (tempStr.startsWith("-") == false) {
          tempStr = targetInfoStream.readLine();
          outputFileStream.writeBytes(tempStr + "\r\n");
        }

        outputFileStream.writeBytes("\r\n");
        outputFileStream.writeBytes("SME Target Selection Results
\r\n");
        outputFileStream.writeBytes("----------------------------
\r\n");

        // write target info to file
        if (targetSelected != 0)
          outputFileStream.writeBytes("TargetSelected: " +
targetSelected +
                                      "\r\n");
        else
          outputFileStream.writeBytes("TargetSelected: " + "none \r\n");

        String aimPointString;
        switch (aimPoint) {
          case 0: {
            aimPointString = "head";
            break;
          }
          case 1: {
            aimPointString = "torso";
            break;
          }
          case 2: {
            aimPointString = "legs";
            break;
          }
          default: {
            aimPointString = "miss";
            break;
          }
        }

        outputFileStream.writeBytes("Coordinates of Shot: " +
aimCoordinateX +
                                    " " + aimCoordinateY + "\r\n");
        outputFileStream.writeBytes("AimPoint: " + aimPointString +
"\r\n \r\n");

        outputFileStream.writeBytes("After-Action Review \r\n");
        outputFileStream.writeBytes("------------------ \r\n");
        outputFileStream.writeBytes("M4Mode:\r\n");
        outputFileStream.writeBytes("
\r\n");
        outputFileStream.writeBytes("p_hit:\r\n");
        outputFileStream.writeBytes("    \r\n");
        outputFileStream.writeBytes("p_kill:\r\n");
        outputFileStream.writeBytes("    \r\n");
      }
      catch (Exception E) {}
      // retrieve new image and refresh frame
      if (getNextImage() == 1)
        imageCount++;
      else {
        try {
          outputFileStream.close();
          targetInfoStream.close();
          this.setVisible(false);
        }
        catch (Exception ex) {}
      }
    }
    else
    {
      //right clicked
      System.out.println("TargetWindow::mouseClicked: Target right-
clicked at (" + e.getX() + ", " + e.getY() + ")");
    }

   }

   /* Method: didRunCorrectly
      Description:  Returns the value of ranCorrectly, which becomes
false if there is an error
                    reading any of the required files
   */
   public boolean didRunCorrectly()
   {
     return ranCorrectly;
   }

   /* Method: charToInt
      Description:  This function returns the value of numerical
characters  (i.e. charToInt('1') = 1)
   */
   private int charToInt(char c)
   {
     return (int)c + CHAR_TO_INT_OFFSET;
   }

   /* Method: stringToInt
      Description:  This function returns the value of numerical string
(i.e. stringToInt('321') = 321)
                    and uses the charToInt function
   */
   private int stringToInt(String s)
   {
     int numDecimalPlaces = s.length();
     int currentPlace = s.length();
     int intLength = s.length();
     int value = 0;
     while (currentPlace > 0)
     {
       value +=
           (int)(charToInt(s.charAt(intLength -
currentPlace))*Math.pow((double)10,(double)(currentPlace-1)));
       currentPlace--;
     }
     return value;
   }
   /* Method: charIsANum
      Description:  Returns true if the char provided is a numerical
character (i.e. charIsANum('1') == true)

(however charIsANum('a') == false)
   */
   private boolean charIsANum(char c)
   {
     if (c >= '0' && c <= '9') return true;
     else return false;
   }
}

// JPanel class definition for image JLabel
class FirstTargetWindowPanel extends JPanel
{
  FirstTargetWindowPanel()
  {
    setBackground(Color.white);
  }
}
```

AfterActionReviewWindow.java

```
/*
 * Title:       AfterActionReviewWindow
 * Description: This is the Window JFrame that displays the
 *                after-action review for each image.
 *              In addition, this Frame is responsible for
 *                 recording aar responses for each image
 *              by writing them to a pre-existing file
 *                 containing the results of the user survey,
 *              the drill excercise, and the list and
 *                 description of each image to be displayed.
 * Copyright:   Copyright (c) 2003
 * Author:      Soar Technology, Inc.
 * Version:     1.1
 * Date:        11.24.03
 */

import java.awt.*;
import javax.swing.*;
import java.awt.event.*;
import java.awt.image.*;
import java.io.*;
import java.io.RandomAccessFile.*;
import java.lang.*;

public class AfterActionReviewWindow extends JFrame implements
ActionListener, ItemListener
{

  // jframe stuff
  Container contentPane;

  // filestream for reading/writing
  RandomAccessFile outputFileReaderStream;
  String fileName;

  //tempstr for sifting through formatting
  String tempStr;

  // coordinates of shot
  int aimPointX; int aimPointY;

  // buttons and text fields
  JButton submitButton;
  JRadioButton singleShot, doubleTap, threeRoundBurst, other;
  JTextField other_text, p_hit, p_kill;

  // constants
  static int CHAR_TO_INT_OFFSET = -48;

  /* Method: AfterActionReviewWindow
     Description:  This is the constructor for AfterActionReviewWindow.
It instantiates the window and
                   the and attempts to open the file created by
UserInfoWindow that contains the results
                   of the user survey and drill excercise
  */
  public AfterActionReviewWindow(String title, String outputFileName)
  {
    super(title);
    fileName = outputFileName;

    // activate contentPane for window
    contentPane = getContentPane();
    contentPane.setBackground(Color.white);

    // attempt to open outputFileName
    try {outputFileReaderStream = new RandomAccessFile(new
File(outputFileName), "rw");}
    catch (Exception E)
    {

System.out.println("AfterActionReviewWindow::AfterActionReviewWindow:
ERROR - Could not open " + outputFileName + " for filestream.");
      this.setVisible(false);
    }

    // retrieve first image
    getNextImage();
  }

  /* Method: getNextImage
     Description:  This method clears the active window and loads the
next image referred to in *username*.txt along
                   with the after action review questions.  In addition,
this method is also responsible for adding
                   the crosshairs of the shot taken by the user on the
current image during the drill excercise
  */
  private int getNextImage()
  {
    // clear the frame
    contentPane.removeAll();
    contentPane.setLayout(new FlowLayout(FlowLayout.CENTER));
    ImageIcon tempImage;

    // attempt to read next image string from file
    try
    {
      tempStr = " ";
      while ((tempStr.startsWith("FILENAME:") ==
false)&&(tempStr!=null))
        tempStr = outputFileReaderStream.readLine();
    }
    catch (Exception E) {return 0;}

    String theImageName = tempStr.substring(10,tempStr.length());

    if (theImageName == null) // exit if no more images present in file
      return 0;
    else // otherwise, place image in frame and repaint frame
    {
      // create new image from filename
      tempImage = new ImageIcon(theImageName);

      // debug image name
      System.out.print("AfterActionReviewWindow::getNextImage: Image
Displayed:  ");
      System.out.println(theImageName);

      // display shot coordinates on image
      String tempString = " ";
      while (tempString.startsWith("Coordinates of Shot") == false)
        try {tempString = outputFileReaderStream.readLine();} catch
(Exception E) {}
      tempString = tempString.substring(20).trim();
      String xcoordString = tempString.substring(0,tempString.indexOf('
')).trim();
      String ycoordString = tempString.substring(tempString.indexOf('
')).trim();

      aimPointX = stringToInt(xcoordString); aimPointY =
stringToInt(ycoordString)+5;

      // add bullet to image
      Image imageWithBullet = tempImage.getImage();
      int w = imageWithBullet.getWidth(this);
      int h = imageWithBullet.getHeight(this);
      int pixels[] = new int [w * h];
      PixelGrabber pg = new
PixelGrabber(imageWithBullet,0,0,w,h,pixels,0,w);
      try {pg.grabPixels();} catch (Exception E) {}

      // create crosshairs around target
      for (int x = (aimPointX - 10); x < (aimPointX + 11); x++)
        for (int y = (aimPointY); y < (aimPointY + 1); y++)
        {
          pixels[w*y + x] = 0xff000000 | Color.ORANGE.getRed() << 16 |
Color.ORANGE.getGreen() << 8 | Color.ORANGE.getBlue();
        }

      for (int y = (aimPointY - 10); y < (aimPointY + 11); y++)
        for (int x = (aimPointX); x < (aimPointX + 1); x++)
        {
          pixels[w*y + x] = 0xff000000 | Color.ORANGE.getRed() << 16 |
Color.ORANGE.getGreen() << 8 | Color.ORANGE.getBlue();
        }

      imageWithBullet = createImage(new
MemoryImageSource(w,h,pixels,0,w));
      tempImage.setImage(imageWithBullet);

      // create new imageLabel from new image
      JLabel theImageLabel = new JLabel(tempImage, JLabel.NORTH_EAST);

      contentPane.add(theImageLabel);

      // resize frame to compensate for variable image sizes
      this.setSize(tempImage.getIconWidth()+10,
tempImage.getIconHeight()+ 200);

      JLabel targetSelectedLabel = new JLabel("You fired at the point
displayed above");
      contentPane.add(targetSelectedLabel);

      // add AAR questions and answer slots
      AfterActionReviewPanel modeOfFirePanel = new
AfterActionReviewPanel();
      modeOfFirePanel.setLayout(new FlowLayout(FlowLayout.CENTER));
      JLabel M4ModeLabel = new JLabel("Mode of Fire:  ");
      ButtonGroup M4ModeGroup = new ButtonGroup();
      singleShot = new JRadioButton("Single Shot");
      singleShot.setBackground(Color.white);
      singleShot.addItemListener(this);
      M4ModeGroup.add(singleShot);
      doubleTap = new JRadioButton("Double Tap");
      doubleTap.setBackground(Color.white);
      doubleTap.addItemListener(this);
      threeRoundBurst = new JRadioButton("Three-Round Burst");
      threeRoundBurst.setBackground(Color.white);
      threeRoundBurst.addItemListener(this);
      other = new JRadioButton("Other");
      other.setBackground(Color.white);
      other.addItemListener(this);
      M4ModeGroup.add(singleShot);
      M4ModeGroup.add(doubleTap);
      M4ModeGroup.add(threeRoundBurst);
      M4ModeGroup.add(other);
      other_text = new JTextField(10);

      modeOfFirePanel.add(M4ModeLabel);
      modeOfFirePanel.add(singleShot);
      modeOfFirePanel.add(doubleTap);
      modeOfFirePanel.add(threeRoundBurst);
      modeOfFirePanel.add(other);
      modeOfFirePanel.add(other_text);
      contentPane.add(modeOfFirePanel);

      AfterActionReviewPanel probPanel = new AfterActionReviewPanel();
      JLabel p_hitLabel = new JLabel("Probability of Hit: ");
      p_hit = new JTextField(3);
      JLabel p_killLabel = new JLabel("Probability of Kill: ");
      p_kill = new JTextField(3);

      probPanel.add(p_hitLabel);
      probPanel.add(p_hit);
      probPanel.add(p_killLabel);
      probPanel.add(p_kill);
      contentPane.add(probPanel);

      submitButton = new JButton("Submit");
      submitButton.addActionListener(this);
      contentPane.add(submitButton);

      // repaint and show
      repaint();
      show();

      // indicate success
      return 1;
    }
  }

  /* Method: charToInt
     Description:  This function returns the value of numerical
characters  (i.e. charToInt('1') = 1)
```

```
  */
  private int charToInt(char c)
  {
    return (int)c + CHAR_TO_INT_OFFSET;
  }

  /* Method: stringToInt
     Description:  This function returns the value of numerical string
(i.e. stringToInt('321') = 321)
                  and uses the charToInt function
  */
  private int stringToInt(String s)
  {
    int numDecimalPlaces = s.length();
    int currentPlace = s.length();
    int intLength = s.length();
    int value = 0;
    while (currentPlace > 0)
    {
      value +=
          (int)(charToInt(s.charAt(intLength -
currentPlace))*Math.pow((double)10,(double)(currentPlace-1)));
      currentPlace--;
    }
    return value;
  }

  public void itemStateChanged(ItemEvent e)
  {}

  /* Method: actionPerformed
     Description:  This function is required for a frame to implement
ActionListener.
                  It fires when the submit button is pressed and
records all of the
                  answers indicated at the time of submittal to
*username.txt* and
                  then calls getNextImage to retrieve the next image
  */
  public void actionPerformed(ActionEvent e)
  {
    if (e.getSource() == submitButton)
    {
      // put entries into text file

      String tempString = " ";

      // M4Mode
      try
      {
        // find M4Mode text area in *username*.txt
        while (tempString.startsWith("M4Mode") == false)
         tempString = outputFileReaderStream.readLine();

        // enter user response for M4Mode
        String outputString = " ";
        if (singleShot.isSelected())
        {
          outputString = "Single Shot";
        }
        else if (doubleTap.isSelected())
        {
          outputString = "Double Tap";
        }
        else if (threeRoundBurst.isSelected())
        {
          outputString = "Three-Round Burst";
        }
        else if (other.isSelected())
        {
          outputString = other_text.getText();
        }
        else
        {
          outputString = "No Response";
        }

        outputFileReaderStream.writeBytes(outputString);
      }
      catch (Exception E)
      {
        System.out.println("AfterActionReviewWindow::actionPerformed:
ERROR - Cannot find appropriate place to write M4Mode data.");
        this.setVisible(false);
      }

      // repeat for p_hit and p_kill

      // p_hit
      try
      {
        while (tempString.startsWith("p_hit") == false)
          tempString = outputFileReaderStream.readLine();

        String outputString = p_hit.getText();

        outputFileReaderStream.writeBytes(outputString);
      }
      catch (Exception E)
      {
        System.out.println("AfterActionReviewWindow::actionPerformed:
ERROR - Cannot find appropriate place to write p_hit data.");
        this.setVisible(false);
      }

      // p_kill
      try
      {
        while (tempString.startsWith("p_kill") == false)
          tempString = outputFileReaderStream.readLine();

        String outputString = p_kill.getText();

        //long numBytesInTempString =
Long.getLong(tempString).longValue();

//outputFileReaderStream.seek(outputFileReaderStream.getFilePointer() -
numBytesInTempString);
        outputFileReaderStream.writeBytes(outputString);
      }
      catch (Exception E)
      {
        System.out.println("AfterActionReviewWindow::actionPerformed:
ERROR - Cannot find appropriate place to write p_kill data.");
        this.setVisible(false);
      }
    }
    if (getNextImage() == 0)
    {
      try
      {
        System.out.println("AfterActionReviewWindow::actionPerformed:
Attempting to close " + fileName);

outputFileReaderStream.setLength(outputFileReaderStream.getFilePointer()
);
        outputFileReaderStream.close();
      }
      catch (Exception E)
      {
        System.out.println("AfterActionReviewWindow::actionPerformed:
ERROR - Cannot close " + fileName);
      }
      this.setVisible(false);
    }
  }

}

// JPanel class definition for image JLabel
class AfterActionReviewPanel extends JPanel
{
  AfterActionReviewPanel()
  {
    setBackground(Color.white);
  }
  public void paintComponent(Graphics g)
  {
      super.paintComponent(g);
    // write stuff in panel
  }
}
```